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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information

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PROPORTIONING BRAKE-SHOE PRESSURES TO WHEEL LOADS

The layman is dazed, or becomes a radical judge, when doctors disagree. We have had some curious instances of differences of opinion in the conventions of the car builders and master mechanics, but probably none more pronounced than those expressed by two speakers who opened the same topical discussion before the respective associations. In one, the subject was scheduled as "The Desirability of Adjusting Brake Pressure to Light and Loaded Cars," and in the other as "The Necessity of Proportioning Brake Pressure to Wheel Loads." The first speaker held that there are more and stronger reasons against the desirability of adjusting brake pressures to loads than in favor of it. He also held that, if the retaining valve were to be used as it is intended, the present condition of the equipment would give the engineer entire and full control of the train. These remarks were accepted as the sense of the convention without comment. In short, the Master Car Builders' Association does not consider it desirable to adjust brake pressures to light and loaded cars.

When the same subject was before the Master Mechanics' Association the speaker took the ground that it was exceedingly desirable to make this adjustment, and called attention to the fact that a brake pressure of 70 per cent. on a light car of 50 tons capacity falls to 17 per cent. when the car is loaded, making a difference of four to one in the distance that the car would run before being stopped. It was not urged that it would be practicable at present to apply such an adjustable apparatus to general merchandise cars; but that it is quite possible to do so in the case of coal and ore cars that shuttle back and forth in light and loaded service.

This advocacy was likewise allowed to go unchallenged and, by inference, though not by formal action, as in the previous case, it would appear that the Master Mechanics' Association does think it desirable to adjust brake pressures to wheel loads.

It is to be regretted that the subject was not thoroughly discussed in one or the other of the associations; for, though only up as a noon-hour discussion, the subject is certainly one of importance. In looking over the records of the past we find that in 1885 it was urged as advantageous and necessary to apply brakes to both trucks of a freight car instead of to one only, which was current practice of the time; a suggestion that has been universally adopted in order to increase the total of the braking pressure and

thus increase the efficiency. After the Burlington tests there were a number of attempts to secure an automatic adjustment of the brake-shoe pressures to the requirements of light and loaded cars. As the arrangement by which this was to be accomplished depended upon a mechanical connection on the truck whereby the leverage was varied in accordance with the compression of the springs, the working was unsatisfactory and the designs were never introduced. This is cited merely to show that as soon as the air-brake had gained a foothold in freight service, men began to think about making it equally efficient upon loaded as upon empty cars. It is difficult to see how there can be any doubt that such action is desirable. But to discuss the practicability of any device that may be offered is quite another matter.

A discussion of the question is especially pertinent at the present time in view of the stresses on the brake-beam. In the report of the committee attention was called to the changed conditions now existing as compared with those of 1889, when the 7,500 lbs. capacity was established as the minimum for a beam. Then the cars ranged in light weight from 18,000 to 34,000 lbs., with an average of about 25,000 lbs. Now the light weight of high capacity cars may be as much as 45,000 lbs., so that taking 70 per cent. as the shoe pressure of the earlier cars and 90 per cent. as that used on the modern ones, the brake-beam loads have risen from 6,200 lbs. to 10,125 lbs. This, for empty cars. Now, if a beam is to be designed to carry a 70 per cent. pressure of a loaded 50-ton car, it must sustain at least 21,250 lbs. If the car weight is placed at 40,000 lbs. and a 10 per cent. overload is allowed. Great as this burden is, it will be higher still in many cases where the cars are heavier or the weights carried greater; as in the case with cars that are being marked up 10 per cent. in nominal capacity where steel wheels are applied.

As strength and freedom from deflection or permanent set under excessive loading are essential qualifications for a brake-beam to meet, the problem is not a simple one. If room is scarce beneath a truck in which to place a beam of 25,000 lbs. capacity, when loaded at its center, it may be possible either to discard the beam altogether or else to apply the stresses near the ends and so lighten the structure. The same thing has been done, though for other reasons, on electric cars where all of the space between the axle and the bolster is occupied by the motors. Here two pull rods have been used and a brake obtained that has worked with entire sat-

isfaction. It goes without saying that if it is found to be desirable to put a load of 12,000 or 13,000 lbs. on the brake-shoes of each wheel, a means will be found to meet the mechanical requirements.

There is still another aspect of the case that should receive careful consideration, which, at first sight, may seem to make for the use of the lower limit of pressure. This view takes the possible effect on the wheels into consideration. While the effect of the exceedingly high pressures for long distances on grades would undoubtedly be the cause of much cracking, it must be remembered that such a condition is not apt to occur, since such pressures would undoubtedly stop and hold any car on any workable grade. The consequence would be that the engineer would soon learn to make a lighter application on the loaded trains, thus holding the train under control with no more injury to the wheels than occurs under present conditions of service. It is true that injury might be expected in cases where an engineer, knowing that he had an exceedingly powerful brake available, would allow a train to reach a very high speed on a long and steep grade, and then apply with full force in order to make a stop. This would undoubtedly result in some heating, but whether that would be sufficient, within the comparatively short interval during which it would be in operation to cause injury cannot be predicted accurately from data thus far secured.

It is clear, in view of the great weights carried by present day cars, and the high speeds at which all classes of equipment are likely to be run, together with the effective train control that these conditions demand, should be placed in the hands of the engineer, that this discussion of the desirability of proportioning brake shoe pressures to light and loaded cars deserves more attention and discussion than was granted it at the recent conventions of the two great mechanical associations.

HANDLING HEAVY PASSENGER TRAVEL.

Now that the period of summer travel has come, bringing to railroads an increased and on certain days exceptional rushes of passenger travel, it may be interesting to observe one or two of the conspicuous cases of heavy travel and some of the methods employed in successfully handling the traffic. The summer has for most roads certain well marked high points of passenger travel, such as the first of July, the fourth of July, the first of August and the first of September, including Labor Day. At these times, usually crowded into one or two days, comes a great rush of travel. For example, on the New York Central on June 30, 1905, which fell on Friday, with the fourth of July on the following Tuesday, there were 38 through passenger trains run on the main line out of the Grand Central Station at least as far as Albany or Troy. The regular service was 27 through regular passenger trains, not including two solid mail and two solid express trains. On that day there were extra sections of nine trains run, two each of the Fast Mail leaving at 8:45 a. m., of a second Fast Mail leaving at 12:50, of the Twentieth Century Limited leaving at 3:30, of the Hudson River Special leaving at 4, of the Western Express leaving at 6, and of the Northern Express leaving at 7; four, of the Adirondack and Montreal Express leaving at 7:30, and two sections each of the Buffalo and Cleveland Special leaving at 8 and of the Western New York Express leaving at 9:20 p. m. This year as the Fourth of July came in the middle of the week the travel was not so concentrated on any one day. As an example of the rush of inbound traffic, on September 5, 1905, the day after Labor Day, eastbound there were two sections of the Adirondack and Montreal Express and six sections of the Buffalo Special, which regularly carries a large proportion of the Thousand Islands and Adirondack travel east of Utica. On the morning of that day there were 75 extra sleeping cars run into New York, largely from those two districts. Some of these were running continuously for two days, for instance, leaving Loon Lake one night, reaching New York the next morning, running back at once in special trains to Loon Lake and back to New York on regular trains the following night. A large percentage of all the outbound summer resort travel of the previous two months was coming back within 48 hours.

It is easy to see that with such bunching of travel as this it is most difficult to handle it smoothly. One particular difficulty formerly experienced was that so much baggage was suddenly presented for transit that the baggage system of the railroad gave way and baggage was delayed for days with consequent great confusion. This state of affairs has now been largely avoided in two ways:

By running special baggage trains carrying baggage cars only, and by the extended use of special delivery checks (for which there is a small extra charge to the passenger) which enable the transfer companies at destination to claim their baggage immediately on arrival. Through the two weeks around the first of September when travel was so heavy into New York, two regular baggage trains were run every day on the main line of the New York Central, arriving at Grand Central Station at 11 a. m. and 11 p. m. Baggage cars were cut off from regular trains at Albany and these solid baggage trains run as sections of some of the regular trains. On the days of the biggest rush of inbound baggage the express agents of the transfer companies went up the road as far as Albany in order to have their pieces of baggage sorted out and ready for immediate delivery to teams on arrival at New York. Tuesday, September 5, 1905, the day after Labor Day, holds the record for the Grand Central station baggage room in pieces of inbound baggage handled. The New York Central furnished 3,924 pieces, the New York & Harlem 379 pieces, a total of 4,303 pieces, and the New York, New Haven & Hartford, over which also special baggage trains were run, 4,047, a total of 8,350 pieces handled. On the same day there were 3,151 pieces of outbound baggage handled; 1,581 for the two New York Central lines and 1,570 for the New Haven road. The corresponding, though not as great, rush of outbound baggage was on the first of July, when 4,015 pieces were handled for the New York Central, 465 for the Harlem and 2,479 for the New Haven, a total of 7,259 pieces. These two days were each by far the largest for the year.

A time when the New York, New Haven & Hartford has rush passenger schedules not common to most other roads is on the days of the Yale football games at New Haven. At the time of the Yale-Harvard game at New Haven on November 19, 1904, extra trains were handled as follows: On the New York division 14 trains in and 14 trains out; on the Hartford division 11 trains in and 7 trains out; on the Shore Line division 5 trains in and 6 trains out; on the Air Line-Northampton division 1 train in and 2 out; on the Naugatuck division 1 train out; a total of 61 extra trains. On the day of the Yale-Princeton game at New Haven, November 18, 1905, there were run extra trains as follows: On the New York division 18 trains in and 17 trains out; Hartford division 3 trains in and 3 trains out; a total of 41 extra trains. On football or boat race days when special service is required to care for a large travel, the New Haven's practice is to make a special schedule or time-table for such additional trains as may be needed. The largest number of sections of regular trains run on the New Haven at times of heavy summer resort travel has been four against six on the New York Central. The New Haven's regular service, however, is unusually frequent and extra sections are run on several different schedules. On most roads where there are such heavy periods of travel the actual operation of the trains is governed entirely by block signals, so that the large number of sections does not complicate operation except by filling up the road. In cases where block signals are not used, such trains are run under the regular rights of sections of regular trains.

STEAM AND TROLLEY IN MASSACHUSETTS.

History, in the matter of the relations of steam railroad and street railway corporations, has during the last few weeks been making itself at a pretty rapid pace in Massachusetts. The condensed story takes us back to the early part of the session of the Legislature of that state, when a bill, supposed to be in the interest of the Boston & Maine corporation seeking power in Massachusetts to absorb electric roads, was introduced. The usual committee hearings followed, attended with much discussion of the measure in the state press and with some stress laid on the inconsistency of allowing the New York, New Haven & Hartford Railroad Company to absorb street railway systems in Massachusetts *de facto*—by the device of "holding" companies—and at the same time not allowing the Boston & Maine to do the same thing *de jure*. The event in this first chapter of the proceedings was negative, not to say abortive. By a vote of 151 yeas to 41 nays, with 11 pairs, a motion prevailed in the lower house to refer to the next Legislature.

The second chapter was more dramatic. Just as the Legislature was on the verge of adjournment the whole matter was reopened by a message from Governor Guild which, we are bound to say, contained some traces of demagogism both in tone and substance. The Governor sharply attacked the whole theory of steam-electric mergers, denounced the policy of allowing outsiders to control trolley competition and asserted that the present control of electric

systems in Massachusetts by the New Haven corporation had been illegally acquired. The lower house, thereupon, passed a bill which expressly prohibited steam railroad companies from controlling Massachusetts street railway corporations and further directed that the railway stocks and bonds held by the steam companies should be disputed by December of next year. The measure fell between the two houses. The Senate refused to agree and, in effect, substituted a report of the joint railroad committee calling for an adjudication by the state Supreme Court of the question whether the New Haven company was in legal possession of its street railway holdings in Massachusetts and forbidding further acquirement of street railway properties until the decision of the court had been rendered. A conference committee failed to harmonize the two houses and the legislature adjourned.

But if direct and practical results appear to be negative, questions have been raised in Massachusetts of the utmost moment in both their legal and their material bearings on future mergers of steam and trolley lines and reaching, in the look ahead, far beyond the bounds of that state—a commonwealth, by the way, which in the past has had a good deal to do in the way of precedents of general railroad policy.

The technical questions involved, while cloudy and indeterminate, are interesting. The New York, New Haven & Hartford Railroad Company, an original Connecticut corporation, and by its charter, under control of a majority of directors resident in that state, actually owns comparatively few miles of steam track in Massachusetts, and, except by recent mergers of subsidiary lines, its steam line in the state is very trivial indeed. In this statement, however, a sharp distinction must be drawn between railroad property owners and that held by lease like the great property of the Old Colony system, with its costly Boston terminal. A statute of Massachusetts prohibits direct or indirect ownership of street railways by steam corporations. How far does such a state law apply to a company in the New Haven's legal situation? But more important is the query how far the law reaches the intermediary corporations through which the steam corporation exercises control of the street railways. With their intricate legal elements we cannot answer such questions even if we would. But it may be remarked that they seem to the logical eye complex enough to tie up the case for some time, with possible appeal on constitutional questions to the highest federal court; and beyond lies the legal *status* of the expedient of the transfer of interests from a holding corporation to individuals presumptively—though presumptive is far from legal proof—acting in the interest of the acquiring corporation. Touching somewhat indirectly on legal queries is the case of the Massachusetts Electric Companies which holds a large number of street railway properties in the state. The Street Railroad Commission of Massachusetts has treated this large holding company almost as an extra-legal corporation with the standing of an individual holder of the stocks and bonds of the controlled street railway companies. The Commission, for example, exacts, if we are not mistaken, no reports from the holding company, while insisting on separate reports from each of the companies that it controls. There is a difference, obviously, between the Massachusetts Electric Companies as an independent corporation and the same company under control of a steam railroad organization or of another holding company. But the distinction is statutory rather than logical.

In a secondary aspect of the case there is a mixture of moral and legal factors. The law of Massachusetts, as stated, prohibits control of a street railway by any one of its own chartered steam railroad corporations directly or indirectly. Whether that statute applies to any foreign railroad corporation—and its holding company or companies—or not the statute, nevertheless, declares the general policy of the state. It is argued, therefore, with force that, knowing the state's proclaimed policy, any railroad corporation like the New Haven that buys a street railway in Massachusetts does it at its own risk—certainly risks the charge of a moral violation of the law. To this view, on the other hand, there are some qualifications. As we recall it some three years or more have passed since one or two of the outlying Worcester street railways were bought up and consolidated in the Worcester and Connecticut Eastern system, itself openly controlled by the New Haven company. Why, in that case, did not the Massachusetts authorities act? Why, also, did it not interfere later when the Springfield system was acquired? Inert state authorities to some degree become partners in such transactions, and to that extent are estopped from raising the "moral" plea now. It is as if a landowner brings suit for the trespasses long past after allowing public passage through his property. The state of Massachu-

setts had a "policy," but did not enforce it. That a railroad corporation, under such conditions of inactive and foggy law, when threatened with long-distance electric rivalry, should have sought a safeguard for the future by the purchase of Massachusetts electric roads may or may not have been a breach of the spirit of the statute, but was a natural outcome of corporation policy. Such a condition also gives strength to the contention of the Springfield *Republican* and other Massachusetts newspapers that the state has enough of law bearing on the question already and had better appeal to existing statutes rather than to new legislation—which, by the way, must necessarily have some awkward and doubtful retroactive features.

The wider horizons of the subject of steam-trolley consolidation were also opened during the hearings before the Massachusetts Railroad Committee and the debates in both legislative houses. As was to be expected many words were used on the subject of "monopoly" and most of them misused. The underlying facts were forgotten that of late years the railroad corporations have grown both sensitive and responsive to the "monopoly" cry, and that the word is quite as sure to spell improved service on the absorbed trolley lines as on the short subsidiary and branch steam roads taken in during the past upbuilding of our great railroad systems. More strenuously was urged at the Massachusetts capital and in her press that steam railroad ownership of the street railways meant obstruction, if not check, on local trolley extensions, especially on such rival extensions as otherwise might be made in steam railroad territory. The argument is valid for new and rapidly developing regions at the West and fifteen years ago, at the first period of swift conversion of the old horse railway into the trolley, would have been valid also in the populous states of the East and Middle West. In the two latter regions it loses most of its force now, as regards the localized trolley, inasmuch as profitable trolley territory has already been so widely exploited; and in the case of Massachusetts, as the Railroad Commission returns have proved, investors have too often found out to their cost that the supposed "profitable" local trolley project has not turned out so in the sequel.

But the same argument—frequently used in the Massachusetts proceedings—as applied to long-distance electric rivals of steam lines had much greater plausibility, especially as the evident policy of the New Haven company in the purchase of large urban street railway systems in Massachusetts and Connecticut has been aimed primarily at checking projects for long-distance electric competitors. Here once again we find the argument, that sounds so coherent, modified seriously by the facts of railroad—and railway—history. In that history consolidation has been a fact as impressive and inexorable as the law of Kepler. Starting with the steam lines several decades ago and developing swiftly during the last two decades, it next has involved the street railways, and is now beginning to merge both sets of lines. The process seems destined to proceed as steadily and surely as the stars in their courses; and a little farther ahead is the vital theorem, nearing complete demonstration, that electricity is soon to span the gap between the trolley and the steam road and the local trolley car be entrained for the present steam trunk line. Suppose, for an example, that President Mellen's plan in Connecticut of "bunching" street cars for distribution and redistribution on his steam line prove a success. In such case is it not easily conceivable that a Massachusetts policy of obstructing present steam-trolley consolidation would find the state belated in receiving its benefits? Certainly the argument is a very strong one that, in the present period of electric transition, with, perhaps, vast and revolutionary results near at hand, Massachusetts will go wisely if she goes slow.

German Tax on Railroad Tickets.

Next August there goes into effect a law of the German Empire imposing a tax on railroad tickets. As there has long been an agitation for a reduction of fares on German railroads, and as all but a small part of the railroads are owned and worked by the Governments, this may puzzle the average foreigner. It must be remembered, however, that the railroads are owned by the separate states of the Empire, and that the Empire itself has none except those of Alsace-Lorraine and has very few sources of income, the great bulk of public expenses and the chief sources of income attaching to the states. The ticket tax is not imposed on those costing less than 60 pfennigs (14 cents); from that to 2 marks the tax is 1.2, 2.4 and 4.8 cents for the three classes, respectively; double these rates for fares above 2 up to 5 marks; four times as much for fares from 5 to 10 marks; eight times as much from 10 to 20 marks; 12 times as much from 20 to 30 marks; 18 times as much from 30 to 40 marks; 28 times as much from 40 to 50 marks; and for tickets costing

more than 50 marks (\$11.90), 40 times as much, or 48 cents, 96 cents and \$1.92 per ticket, for the three classes, respectively.

Thus the tax is a higher percentage of the cost of the higher class tickets; if you pay 48 cents fare, you must pay 10 per cent. of it as tax if you take a first-class ticket; 5 per cent. if you take a second-class ticket of the same price, and only 2½ per cent. if you take a third-class ticket costing 48 cents. Moreover, the tax is higher in proportion, for the costlier tickets, which means that long journeys bear a higher tax, proportionately, than short ones. As we have seen, a 2-mark first-class ticket pays 10 per cent. tax, but a 40-mark first-class ticket pays 13½ per cent., and a 50-mark ticket, 16 per cent. If your ticket (first-class) costs \$12, you will pay \$1.92 tax.

The assumption seems to have been that the longer journeys are chiefly by those who will feel the tax least, and not enough to cause a considerable proportion of them to take lower-class tickets.

The most notable feature of the law, however, is that fourth-class tickets are not taxed at all. Now, the fourth class is a North German institution, and a very large proportion of the short journeys are made in this class. Of course the corresponding class of passengers in South Germany travel third class, and so will be taxed. Where the fourth class exists it is feared by some that there will be such a diversion to it from the third class as to make the stock of fourth-class cars insufficient, and that of third-class cars excessive. Trains running considerable distances do not have fourth-class cars, however. It will be interesting to see what the effect will be.

By the same law a stamp tax is imposed on freight way-bills; but it apparently will not add materially to the freight charges.

American Car & Foundry Company.

The annual report for the year ended April 30, 1906, covers only two pages and shows no more in regard to the company's affairs than is included in the general balance sheet, a statement of net earnings and their disposition, and a statement of working capital. Some further information in regard to operation was given at the annual meeting by the President. The printed report makes no reference to gross earnings, but, according to this statement, gross earnings for the year were about \$74,000,000. The sum of \$5,648,553 mentioned in the report as earnings from all sources apparently represents net earnings after operating expenses. The record of net earnings after operating expenses for the past four years is significant of the fluctuation of the car building industry. The net earnings of \$5,600,000 in 1906 compare with \$3,800,000 in 1905, \$5,600,000 in 1904, and \$8,400,000 in 1903, the last the company's record figure. From the 1906 figure, there was deducted for renewals, replacements, repairs, new patterns, flasks, etc., \$1,490,103, as well as \$350,791 for new construction, leaving \$3,807,660 as net earnings after these deductions for betterments. A dividend of 7 per cent. was paid on the preferred stock, and in addition an extra payment of 1½ per cent. was made on July 1, 1905, to bring dividend periods and quarterly reports in conformity with the fiscal year. The total dividend payments of \$2,450,000 left the year's surplus at \$1,357,660, or 4.52 per cent. on the \$30,000,000 common stock. This sum was added to the previous profit and loss credit balance, raising the total surplus to \$14,113,094.

The balance sheet shows an addition of \$1,266,681 to the item Cost of properties, plants, etc., for new plants and extensions, bringing the item to \$59,371,979. Materials on hand amounted to \$19,150,000 against \$11,930,000 in 1905, a large increase which is balanced by an increase slightly larger in audited vouchers. Stocks and bonds of other companies, carried at \$1,280,888, earned on the average 12 per cent. during the year against 11 per cent. in the year previous. The statement of working capital shows a gain of \$90,979 over the amount on April 30, 1905, making the working capital at the close of the year \$14,741,115.

The President reported that during the year the company manufactured 73,540 cars—72,757 freight cars and 783 passenger cars. Of the freight cars, 38,239 were of wood and 34,518 of steel construction. Of the 783 passenger cars 564 were wood and 219 steel. The company also made 949,951 car wheels. The total car production—73,540—compares with 35,857 cars of all kinds built in the preceding fiscal year, which shows the great increase in business during the recent year. Orders on hand at the beginning of the new year amounted to 71,369 cars against 44,000 cars a year previous. On April 30 the company was employing 27,807 men at its various plants. It is no surprise to learn that the year was a prosperous one and from present indications it seems entirely probable that the current year will prove equally satisfactory to the company's business.

The Pennsylvania Railroad, answering the suit concerning its mileage ticket which has been brought, at the instance of the Philadelphia drummers, in the Dauphin County Court, says that there are constantly in use sixty thousand of those tickets (on the Pennsylvania and six other roads); and for this reason, one of the main demands of the drummers, that lost tickets be bulletined to conductors, cannot be met. The most of the drummers' complaints are

based on the flimsiest arguments. Their real demand is to have the tickets sold at a flat rate, abolishing the ten-dollar rebate, and that the railroads shall make the tickets usable by any one instead of limiting each ticket strictly to the purchaser's own use. This is a proper desire, provided it is not based on a purpose to speculate in the tickets or cheat the railroad in their use; but it is a question of price, after all. Some of the drummers' points are so childish as to be laughable. One of them is that the ticket is inconvenient for a passenger who cannot read. On the point that if a passenger loses his ticket, the road will not reimburse him for his loss, the answer rightly remarks that the mileage ticket is subject to exactly the same dangers as any other ticket—or as the man's watch or pocketbook. But we did not begin this paragraph with a view to wearying the reader with trifling arguments—which the Pennsylvania Railroad has had to answer in a sober 15-page pamphlet, addressed to the court—but mainly to quote one of the company's statements concerning the management of these tickets:

"The company admits as averred that no provision is made for the name or address of the purchaser or individual on or upon any part of the mileage book, and that the book as received by the purchaser after the agent's stub is torn off, gives no identification of ownership. But it denies that in case of loss the book 'is irrecoverable, or is without means of identification.' Each ticket is numbered and the owner may upon the cover of the ticket, or upon the ticket itself, write his name or initials.

"It admits that some years ago it issued a thousand mileage ticket for the sum of \$20, but it avers that such ticket was not an interchangeable one, and it denies that no restrictions were placed upon its use. It was to be used only by the person purchasing it, and the identity of that person was established by his signature to the ticket and coupons. Owners of these tickets desired to be relieved from the duty of placing their signatures upon the backs of coupons, and the signature feature was waived, although not formally expunged from the contract. The result was that in a short time it was discovered that, notwithstanding the laws against ticket scalping, these mileage tickets were purchased and sold in large numbers by ticket scalpers, and in many instances were rented by their owners to ordinary travelers. Experience having demonstrated the impossibility of enforcing the contract that such tickets should be used only by their owners, this defendant had almost reached the conclusion that proper consideration for its interest and that of the traveling public required it to abolish the use of mileage tickets of that character. At or about that time, urgent requests were presented to the defendant by the members of commercial organizations and by business men for the issuance of a ticket at a low mileage rate, which could be used not only on the lines of the railroad of the defendant, but on those of other railroad companies. In compliance with these requests, and to meet these demands, the present form of mileage was issued, and, in order to protect . . . against scalping and misuse, a ticket in its present form was issued. . . . No attempt is made to protect a passenger against the loss of his ticket, simply because it is a tested impossibility to afford him such protection. A ticket that had been lost might be bulletined, but the chance that it would be discovered by a conductor and taken up is too remote to be of sensible advantage to its owner. For years this defendant sought to protect itself from the presentation for redemption of lost or stolen tickets, good only over its own lines of road, by the issuance of bulletins containing descriptions of such tickets. These bulletins were reissued at the end of each year. The results of those efforts was that about half the tickets lost by passengers and reported to the defendant were afterwards found by them and sent in for redemption. The other half of the tickets so bulletined were never heard from, and the lists of such tickets became so voluminous that it was impossible to carry them forward from year to year; so that the company would have no protection against the redemption of a ticket that may have been bulletined last year or the year before, and that is brought in for redemption during the current year. . . . The method by which the owner of any used ticket, obtains the refund of \$10 is an easy, quick and economical one. Every authorized ticket agent of any line named on the ticket is required to receive the cover and forward it immediately to the Trunk Line Mileage Ticket Bureau in New York City, without expense to its owner; or, the owner of such ticket may directly transmit the ticket cover, with application for refund, to the Trunk Line Mileage Ticket Bureau in New York City. The lapse of time between the arrival of the cover with blank for refund and the return of the money does not now usually exceed an average period of four days. Whatever—if anything—the defendant may have received as and for interest on the \$10 subsequently refunded to purchasers of mileage tickets sold by the defendant is not sufficient to pay the defendant's proportionate part of the expenses of the Mileage Bureau, which must be maintained by the different railroad companies over whose lines such tickets can be used."

For New Publications, see page 32.

CONTRIBUTIONS

The Personnel of the Commission.

Chicago, Ill., July 5, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

A great majority of the decisions of the Interstate Commerce Commission during the past ten or a dozen years have proved unsound. As Mr. Walker D. Hines showed so conclusively in his magazine articles and in his testimony before the Elkins Committee, some 27 out of 29 cases—I do not remember the exact number—were reversed or thrown out by the Supreme Court or by some other court of last resort. In some of these cases the commission was wrong both in its apprehension of the facts and in its interpreta-

tion of the law. With this state of things before him, the unprejudiced observer has been almost forced to conclude that the commission was made up of weak or prejudiced or unprincipled men. As there has been no suggestion that any member of the commission is unprincipled, we are shut up to the alternative between the other two explanations.

These men, by act of Congress, have now been given a vote of confidence, and have had their salaries increased \$2,500 a year each.

It surely must be evident to all that it is the personnel of the commission, rather than the specific provision of the law, which is going to have the most weight in railroad regulation. How, then, are we to expect any benefit to follow the reappointment of these men, who have before them a task requiring all skill and judgment, and are not big enough for their jobs?

CYNIC.

Where to Hold the June Conventions.

Grand Union, Saratoga Springs, N. Y.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I received a clipping from your paper which relates to the entertainment of the Master Car Builders' and American Railway Master Mechanics' Associations at Atlantic City last week. With the accommodations that it was possible to have at Atlantic City I have no concern, but with that part of your article which applies to the advantages of Saratoga, I am in entire accord. But I think you owe it to the Associations and certainly to the hotel keepers of Saratoga to explain what you mean in saying: "It is to be hoped that the attitude of the hotels of that village will be such as to make it advisable to again hold the convention there. We know that the two associations would gladly return to Saratoga next year if met in the proper spirit by those who should be most anxious to have them." I would be pleased to know as one who has considerable to do with this matter the exact nature of the complaint against the hotel keepers in Saratoga, or more particularly as they refer to the Grand Union Hotel—wherein they have not been met in a proper spirit by this house. We have surrendered year after year, against our inclination, our lawn for their exhibits until finally those exhibits have outgrown the area which it is possible for us to offer. We have annually made a reduced rate to the associations and have never failed to keep our hotel up to its standard in every respect. The last time they were here it was almost the middle of July before the heavy exhibits were removed from our grounds and the grounds could be put in presentable shape for the season. We have gone to the committees repeatedly and explained to them the impossibility of doing more in the way of entertainment than we have already done. Apparently you do not believe our sincerity, else why would you say that we have not exhibited the proper spirit. Do you think it is likely that we would go against our own interests and deny these associations anything that it is possible to offer them in order to bring them here? It is just such articles as this, in my judgment, that have brought about the conditions which have taken these conventions away from this town. If the members of the conventions would realize our anxiety to meet them in every way possible and at the same time recognize the limits of what we can do, we should be able to better understand each other. It is most unfair to accuse us of not exhibiting the "proper spirit" towards these conventions, when we have done our utmost to bring them here and to make them comfortable during their stay. If you accused the town of not providing the necessary accommodations for such meetings as this that would be another thing, and we would say to you then, as we have said to your committees, that they are not in a position to do anything of this kind, that they also have done as much as they can in the way of making their town attractive for visitors and for the entertainment of such meetings and they should not be held responsible for impossibilities.

In conclusion, let me say that if the railroad journals would show what we might consider a "proper spirit" of fairness towards us, we might be able to arrange matters so that differences might be made less apparent to all, and the meetings might be held as successfully here in the future as they have been in the past. I would be very glad to see the conventions come here, and if they desire to have their headquarters in the other hotels, I would still be glad to have them come. If they desire to come to the Grand Union again, we shall still be willing to do our utmost, as we have in the past, to make their stay a pleasant and profitable one.

W. E. WOOLLEY.

Mr. Joseph W. Taylor, secretary of the M. C. B. Association, comments as follows on Mr. Woolley's defense: "It seems to me that if Mr. Woolley is as anxious as he indicates to have the convention go to Saratoga next year, he should be prepared to submit a definite plan for the location of the exhibits; also a better meeting place for the conventions. We have tried in every way to make the acoustic qualities of the ball room at the Grand Union such that

we could hear the discussions which took place, but without very much satisfaction. Another thing, he should come to our meetings prepared to submit a definite proposition from the hotel people and the other interests at Saratoga just the same as was done at Atlantic City this year and Manhattan Beach last year.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I was pleased to read your article on Master Car Builders and Master Mechanics' Associations, page 656 of your June 22d issue, and hope this matter will be agitated until such places as Atlantic City and Manhattan Beach are excluded as possibilities for places in which to hold the conventions.

I don't think our experience at Saratoga with the hotel keepers was improved upon at Manhattan Beach or Atlantic City, and everyone with whom I talked said they came home from Atlantic City tired out and were able to meet but few, if any, of the people whom they expected at the convention.

If such places as Manhattan Beach and Atlantic City were selected for any number of years the social feature, which has been one of the strong points in cementing the friendship of the members would, in my opinion, be eliminated and railroad men in particular would say that there is more real knowledge distributed among the members outside the meeting rooms than inside.

In speaking of the convention to a friend while at Atlantic City he expressed my views to a letter in saying that it was as good as a tonic to any man to walk down the passageway in the dining room of the Grand Union at Saratoga and greet his friends on the right and left, something that we knew very little about at Atlantic City.

GEORGE W. WEST.

Neglect of the Elkins Law.

WASHINGTON, July 10.—From the beginning of the agitation which has resulted in the enactment of the Hepburn railroad rate law, Senator Foraker of Ohio has insisted that what was needed was more energy in the enforcement of the laws already on the statute books rather than the enactment of new laws, and that the Elkins law, if slightly amended, would afford an efficient and prompt remedy for every conceivable abuse in connection with transportation rates, regulations and practices. The same view was taken by some of the leading railroad attorneys who appeared before the Senate Committee on Interstate Commerce last year. It was pointed out that the Elkins law, if enforced, would enable the law officers of the government, with the assistance of the Interstate Commerce Commission, to put a stop to rebates of all kinds and to all kinds of illegal discriminations and preferences, and that it provided heavy penalties for all those who might be found guilty of its violation. Senator Foraker contended that all that was necessary or desirable in the way of further legislation was a simple amendment of this law so as to make it apply to unreasonable or exorbitant rates as well as to rebates and discriminations.

Since the adjournment of Congress there has been published as a Senate document a statement from the Attorney General in reply to a Senate resolution of inquiry that fully sustains this view as to the efficiency of the Elkins law. The Senate called on Attorney General Moody for a statement of all suits brought under the Sherman anti-trust law, under the original interstate commerce law and its amendments, and under the Elkins law. The reply, sent in on the eve of the adjournment, has escaped general attention. It is of interest chiefly as showing what has already been done under the Elkins law, and as indicating the broad scope of that enactment. The record is such as to suggest the idea that if the efficiency of this law had been fully tested and demonstrated at an earlier stage there would have been little or no agitation for the enactment of additional legislation. It shows that while the administration and the Interstate Commerce Commission were zealously cooperating in the agitation for a law to confer dictatorial powers over commerce upon the Commission they were allowing a most efficient law to become a dead letter, for one of the most remarkable things about the Attorney General's statement is the showing that it makes that almost nothing had been done toward really testing the efficiency of the Elkins act until after the hearings before the Senate Committee had directed public attention to the fact that practically no efforts were being made to use it. Counting as one case the proceedings against the C. & N.W., the Illinois Central, the Michigan Central, the Pennsylvania Company, the P. C. C. & St. L., and the Lake Shore & Michigan Southern, to enjoin departure from published tariffs, there were but four cases instituted under the Elkins law from the date of its going into effect on February 19, 1903, until October 25, 1905—more than two years and ten months. From the latter date until June 29, 1906—the date of Attorney General Moody's statement—a few days more than seven months—there had been instituted no less than thirty-eight cases.

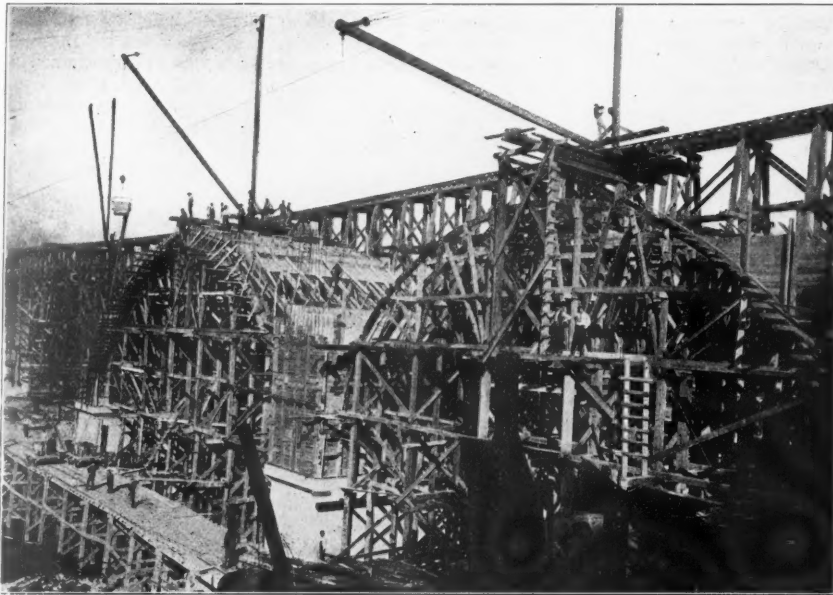
The detailed statement of cases and Mr. Moody's summary show that the law, when enforced, is summary and effective in its operation. Out of 11 indictments for receiving rebates there had been

five convictions, in one case the defendants having been fined \$1,025 each and in four cases the defendant corporations having been fined \$15,000 each. There had been one acquittal and five cases were still pending. Out of nineteen indictments for granting rebates there had been one conviction, the defendant corporation being fined \$40,000 and two individual defendants being fined \$10,000 each. Two cases had been nol-prossed and sixteen cases were still pending. Out of five indictments for conspiracy to obtain rebates there had been three convictions, in one case the defendant having been fined \$1,025, in another case one defendant having been fined \$6,000 and sentenced to jail for six months, and another defendant fined \$4,000 and sentenced to jail for three months, and in the third case the defendants having been fined in the aggregate \$25,000. One case had been nol-prossed, there had been one acquittal, and one case was still pending. In addition to these cases the courts had issued six injunctions to restrain departures from published rates, had dismissed one petition to enforce an order of the Interstate Commerce Commission, and had issued one injunction against giving preferences and rebates. One petition to compel the filing of annual reports had been discontinued, and two cases of procedure to require defendants to testify had been successful.

Mr. Moody explains that the 22 cases of various kinds still pending are cases in which indictments have been returned within the last month or two, and that they will shortly be brought to trial. Since his report has been submitted there have been developments in two of these pending cases. The Chicago & Alton Railroad, with J. N. Faithorn and F. A. Wann, formerly officials of the road, has been found guilty of having granted rebates to the Schwarzschild & Sulzberger Packing Company, and Judge Holt has sustained the indictments against the New York Central road and some of its officials for the alleged granting of rebates on sugar. On the whole the record is such that if it could have been presented a year ago it might have convinced Congress and the country that the existing laws for the regulation of railroads were sufficient, but such record could not have been presented at that time for the reason that neither the Interstate Commerce Commission nor the administration seems to have believed that the Elkins law could be used with success. J. C. W.

Concrete Arch on the Big Four at Danville.

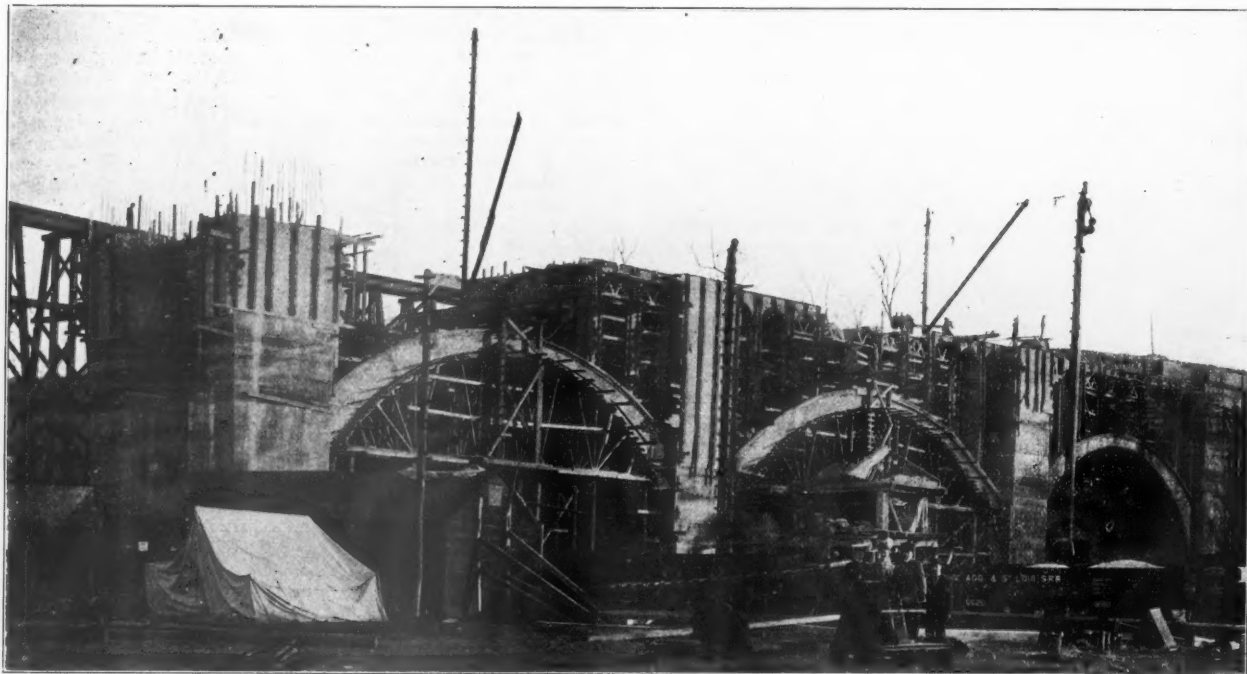
The rebuilding work on the Cairo division of the Big Four was described in these columns last fall (Oct. 27, 1905) and drawings were shown of the more interesting and important of the bridges, which were to be of concrete masonry throughout. The most notable of the structures is the reinforced concrete bridge over the Salt Fork of the Vermilion river just outside of Danville, Ill., the northern terminus of the line. Detail drawings of the design and a de-



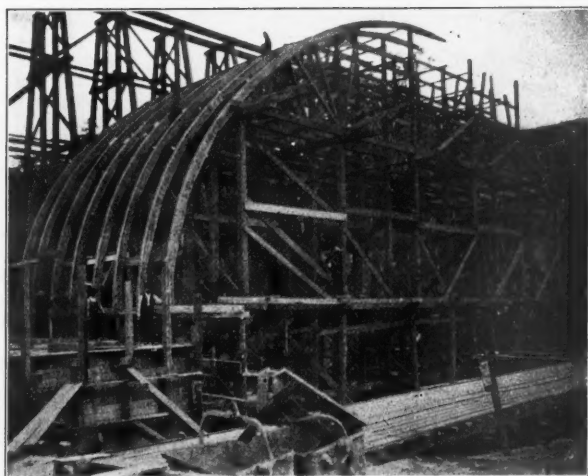
Falsework for Main Arches—Big Four Concrete Arch Bridge at Danville.

scription were given in the previous article. This bridge has lately been finished and several photographic views, taken during the progress of the work and after completion, are shown herewith.

To repeat again briefly the principal characteristics of this bridge, it is a symmetrical three-arch double-track structure, 80-ft. arches flanking the 100-ft. central arch. The former are 30 ft. high above the springing line and the latter 40 ft., the thicknesses at crowns being 3 ft. 6 in. and 4 ft. respectively. The height to base



Progress View of Construction of Big Four Concrete Arch Bridge at Danville Showing Forms and Centering for Spandrel Arches, Forms for Near-End Abutment and Centering for Two Main Arches—Concrete Mixing Plant and Cement Storage House in Foreground.



Main Arch Falsework and Centering in Course of Erection.



Concrete Arch Bridge at Danville, Ill.—Big Four Route.



Detail View at Pier—Big Four Concrete Arch Bridge at Danville.

of rail above bed of river is about 90 ft. The spandrel arches are 8-ft. span and the intervening walls 2 ft. thick.

As mentioned in the previous article, the entrance of the line into Danville by the building of a cut-off $2\frac{1}{2}$ miles long (it formerly used the Wabash tracks from Tilton, just south of Danville) involved some heavy cutting. The material from this was used in the big approach fill at the south end of the bridge and was conveyed thereto across, and dumped from a 90-ft. high timber trestle, which appears in the views on the downstream or east side of the bridge.

Material was delivered to the work over a spur track about a mile long laid up the valley of the stream from the Peoria & Eastern division of the Big Four. The provision of this track was made necessary by the character of the country adjacent to the bridge site, which made the latter practically inaccessible by teams and wagons. The concrete mixing plant was located between this track and the river bank, taking its sand, stone and gravel supplies from cars on the track or from storage piles alongside by means of a derrick and clam-shell bucket. Cement was stored in a small house on the opposite side of the track from the mixer, having capacity for 10 cars. It was delivered to the mixer, a $\frac{3}{4}$ -yd. Smith, on small flat cars which were hauled up the incline to the platform by the derrick hoisting engine. The mixer discharged into $\frac{3}{4}$ -yd. buckets on push cars on a service track beneath the platform. The

normal capacity of the plant was 200 cu. yds. in 10 hours. The space for storage of materials was quite restricted, however, and impeded the continuous working of the plant to full capacity.

For delivery of the concrete to place, a double service track was built across the stream on a trestle and received the cars from the track running under the mixing plant through a turntable. Derricks lifted the buckets from the cars on the trestle and deposited their contents.

The three classes of concrete used, their location in the structure and the order in which the voussoirs were put into the arch rings were given in the previous article. The concrete was laid quite wet and was spaded well back from the forms on all exposed faces, this being the only treatment accorded to give finish to the surfaces. The resulting good effect is plainly apparent in the engravings.

Although concrete work was begun early in August, delays in securing materials prevented commencing work on the main arches until the first of October. The bridge was completed December 17 last. It contains 12,000 cu. yds. of concrete and 130 tons of Johnson corrugated steel reinforcing bars. The centering, falsework and forms required 500,000 ft. b. m. of lumber. The design was prepared under the supervision of Mr. W. M. Duane, then Superintendent of Construction, now Chief Engineer, of the Big Four. The Bates & Rogers Construction Company, Chicago, had the contract, and to them we are indebted for the views shown herewith.

Railroad Decisions in June.

The following decisions in railroad cases were handed down by the federal courts in June:

Collection of schedule rate in place of lower quoted rate.—A carrier may require of a shipper the payment of the regular rate for an interstate shipment as shown by the schedule on file with the Interstate Commerce Commission and posted in the station of the carrier notwithstanding a lower rate was quoted and accepted by the shipper and the goods were shipped under the lower rate. *Texas Pacific Railway Co. vs. Mugg & Dryden*, 26 Sup. Ct. Rep. 628.

Michigan tax law an impairment of a contract.—The provision of the charter of a predecessor of the Detroit, Grand Haven & Milwaukee Railway Company that the company shall pay an annual tax of 1 per cent. on the capital stock paid in, which tax shall be in lieu of all other taxes except penalties and shall be estimated upon the last annual report, is a contract binding on the state and hence would be impaired by the enforcement of the tax law of that state enacted in 1901. *Powers vs. Detroit, Grand Haven & Milwaukee Ry. Co.*, 26 Sup. Ct. Rep. 556.

Discrimination as to cars furnished.—A shipper is not deprived of his right to compel a railroad company to set off to him his equitable proportion of cars for the shipment of his product under the interstate commerce act by the fact that he is a party to an agreement between the carrier and numerous shippers fixing a basis for an equitable distribution of the cars which agreement the carrier has violated by discriminating in favor of other shippers, *United*

States vs. Norfolk & Western Railway Co., 143 Fed. Rep. 266.

Safety appliance act.—The Federal statute requiring the equipment of cars with safety appliances is violated by the act of a railroad company in hauling a car employed in interstate commerce not so equipped from one of its yards to another for the purpose of being put in a train and forwarded to its destination in another state (United States vs. Pittsburg, Cincinnati, Chicago & St. Louis Railway Co., 143 Fed. Rep. 369), and generally where a railroad company hauls over its line within a state a car of another company employed in moving interstate traffic consigned to a point in another state and not so equipped. United States vs. Chicago, Pittsburg & St. Louis Railway Co., 143 Fed. Rep. 353.

Injury to persons on railroad premises.—The Pennsylvania enactment giving a person injured while working about the premises of a railroad company and not an employee the same right of recovery that he would have if he was an employee, is not applicable in a case where the injured person is a stevedore's employee who was injured while standing with others on or near the track of a railroad company after the close of his day's work waiting merely to give in his time to his employer, as it is clear that he was not employed about the railroad company's premises at the time of receiving his injuries. Hobbs vs. Pennsylvania Railroad Co., 143 Fed. Rep. 180.

When action for penalty for discrimination may be brought.—A state statute fixing the time within which actions for the recovery of a penalty may be brought at one year does not apply to actions for penalties for discrimination in violation of the interstate commerce law. Such actions, under the Federal laws, may be brought any time within five years after the cause of action has accrued. Carert vs. New Orleans & Northeastern Railroad Co., 143 Fed. Rep. 99.

Bridges over navigable waters.—A railroad bridge over a navigable stream in accordance with an act of Congress and maintained in accordance with the act cannot be enjoined as a nuisance on the ground that it is an unlawful obstruction to navigation. Such a bridge authorized by a statute without reservation can only be required to be removed by an act of Congress authorizing the same and providing for just compensation. United States vs. Parkersburg Branch Railroad Co., 143 Fed. Rep. 224.

Ohio fellow servant act.—The Ohio statute enacted to restrict the fellow servant doctrine in its application to railroads provides that every person in the employ of a railroad company "having charge or control of employees in any separate branch or department shall be held to be the superior and not fellow servant of employees in any other branch or department who have no power to direct or control in the branch or department in which they are employed." This act in effect divides all of the employees of a railroad company, with respect to those working in separate branches or departments constructively into superiors and subordinates; the superiors being all those having authority over any co-employee whatever and subordinates those having none. Thus understood and bearing in mind that the courts of that state consider that separate trains are separate "branches or departments" the conclusion follows that a railroad company is liable for the injury or death of a fireman through the negligence of the engineer of another train having authority over his own fireman, although he is himself subject to the control of the conductor of his train. Kane vs. Erie Railroad Co., 142 Fed. Rep. 682.

Removal of trespassers from trains.—The principle is well established that a carrier owes no duty to a trespasser on its train in ejecting him therefrom except to abstain from wantonly and recklessly injuring him, and whether or not this is done depends on all the facts and circumstances involved. In no event will the carrier be liable in exemplary damages for injuries though willfully inflicted on the trespasser unless the company authorized or ratified the act, and the fact that the conductor removing the trespasser was not discharged before the trial of the case will not amount to a ratification. Toledo, St. Louis & Western Railroad Co. vs. Gordon, 143 Fed. Rep. 95.

Inspection of equipment.—A railroad company cannot shift to a trainman its duty to make a proper inspection of its cars and thus escape liability to an employee for injuries occasioned by a defect that was not obvious to the employee but which would have been disclosed by the means at the command of an inspector charged with that duty only. Martin vs. Wabash Railroad Co., 142 Fed. Rep. 650.

Construction of bills of lading.—Under the rule of law that a common carrier can limit its common law liability only by conditions clearly and distinctly called to the attention of the shipper, there is no presumption that the shipper had knowledge of these conditions are printed in small type along with other inconsequential conditions. To charge him with this knowledge the condition should be rendered conspicuous by its position or the color or style of the type in which it is printed. As a general rule any reasonable doubt as to the proper construction of the printed portion of a bill of lading should be resolved against the carrier which prepared it. Baltimore & Ohio Railroad Co. vs. Doyle, 142 Fed. Rep. 669.

NEW PUBLICATIONS.

Railway Signal Association; Digest of Proceedings for Eleven Years, 1895-1905. Vol. 1, 546 pages, 6 x 9 ins. New York: H. S. Balliet, Secretary, Grand Central Station. \$4.

This is a valuable work, for the signaling art has grown fast during the past ten years and the history of these years has not been adequately recorded. The second volume is yet to be issued but the first one is justified, by itself alone, for the matter is largely made up of articles not depending on other articles for their value. The work can scarcely be called a digest, in the true sense of the term, for much of the matter is still undigested—and, indeed, was open to the charge of indigestibility when it was originally issued. Discussions were reported with tiresome redundancy and the association was even so amiable in one case as to listen to a paper one year that told only what had been presented by another member about one year before. Moreover, in consequence of the rapid growth before mentioned, some things that were said a few years ago are now out of date. Notwithstanding these defects—which are inevitable, unless the executive committee were to go to the expense of having much matter entirely rewritten—the book preserves important history and will answer many of the questions which are now asked every day by the younger signalmen, provided they will dig for the facts. The compiler has endeavored to arrange the matter by subjects and has in large measure succeeded; but there is much interesting matter in the discussions which is not germane to the topic under which it is given and yet is too valuable to be lost. To get the full value of the work the reader should himself amplify the index by adding names of speakers and dates of utterance, for a great many of the most useful things in the book depend for their value on a knowledge of these elements.

Among the important subjects touched upon with more or less fulness in Volume 1 are: the rules adopted for operation of interlocking plants in 1897; definitions accompanying the same; standard specifications for construction of mechanical interlocking, adopted in October, 1905; a paper on inspection, written by Mr. Elliott in 1899; economy of signaling crossings (Vernon and Peabody); time locks; facing points and slip switches; night color-indications; mechanical distant signals (several papers); batteries, primary and storage—cost of installation and maintenance, care and inspection; disturbance of automatic signals by lightning; management of track circuits; design, maintenance and care of signal lamps, and maintenance and inspection of automatic block signals (Balliet). Many of the papers are accompanied by reports of the discussion which followed their reading, with names of the principal speakers.

Car Builders' Dictionary.—1906 edition. Compiled under the direction of the Master Car Builders' Association by Rodney Hitt. New York: The Railroad Gazette. Leather, 9 x 12 in. 738 pages and 6,344 illustrations. Price, \$6.00.

The early and more or less imperfect editions of this important book need no introduction to railroad mechanical officers. It has been a standard for reference and for practice since its first publication in 1880 and few technical books have exceeded it in the number of copies sold. The fifth revision just made surpasses even the high standard set by previous editions in completeness and accuracy. The number of pages has been increased to 738, nearly 200 pages of illustrations having been added and the number of illustrations increased to 6,344. Most of the pages have been entirely recast and the latest designs of cars and car details substituted for those shown in the 1903 edition. The same arrangement of illustrations into general groups has been followed and one new subject added, that of British cars and details, both passenger and goods. The illustrations under this heading will be found useful by those who may be in the position of having to adapt devices in use on American railroads to equipment on British or colonial railroads. The plan first adopted in the 1903 edition of putting the names of makers under devices shown has proved so helpful to those who use the book constantly as an ordering guide that it has been retained in the present edition. The definitions have been carefully revised and brought up to date. In view of the early publication of a Locomotive Dictionary along similar lines to this book all reference to parts belonging strictly to locomotives or tenders has been omitted.

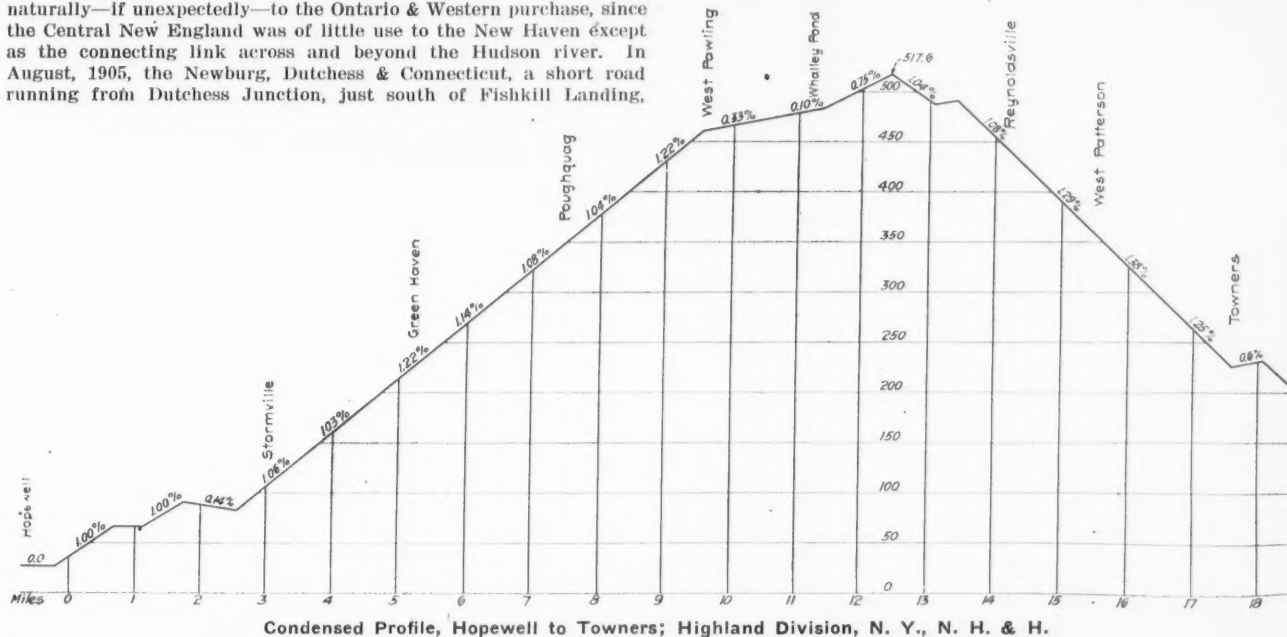
The two electric locomotives which were borrowed from the Valtellina Railroad, which has been worked by such engines for several years, to haul trains through the Simplon Tunnel, have proved inadequate for the work, and have been sent to the shops. Each of these engines had two motors of 450 h.p., which could be urged up to 1,100 h.p. for the engine. There is some difference of opinion as to the cause of the failure. One theory is that as the engines have a section equal to two-thirds that of the tunnel itself, they act as pistons in a cylinder, and waste a large part of their power in compressing the atmosphere in the tunnel. This atmosphere is saturated with moisture from the hot springs which discharge 2,000 gallons per second at a temperature of 111 deg., while the temperature of the tunnel walls is 93 deg. This compressed saturated air is believed to penetrate the insulation of the motors and cause an important leakage of the current and consequent short-circuiting.

Rebuilding the Highland Division of the New York, New Haven & Hartford.

When, in October, 1904, Charles S. Mellen, then lately returned as President to the New York, New Haven & Hartford, suddenly bought control of the New York, Ontario & Western as a New Haven connection with the anthracite coal fields and, potentially, as an influence in the trunk line situation, the Central New England, "the Poughkeepsie bridge route," was already in the hands of the New Haven management. Its acquisition in February, 1904, led up naturally—if unexpectedly—to the Ontario & Western purchase, since the Central New England was of little use to the New Haven except as the connecting link across and beyond the Hudson river. In August, 1905, the Newburg, Dutchess & Connecticut, a short road running from Dutchess Junction, just south of Fishkill Landing,

the main line of the New York, Ontario & Western, Campbell Hall is reached by the Erie over a five-mile branch from its main line at Goshen, is the southern terminus of the Wallkill Valley (New York Central) and the northern terminus of the Lehigh & New England. Maybrook, on the Central New England three miles east of Campbell Hall, is the northern terminus of the Lehigh & Hudson River, which, like the Lehigh & New England, gives connection with the Delaware river region, and the various anthracite roads in that territory.

The Central New England forms the connecting link over the 30 miles to and across the Hudson river at Poughkeepsie; thence



north to a connection with the Central New England near the northwest corner of Connecticut, was also acquired. The New York, New Haven & Hartford had been paying for 11 miles of trackage over this line, bringing its westernmost (Highland) division into Fishkill Landing on the Hudson river. With all these roads safely in hand, the New Haven management turned its attention to working out a satisfactory route for east and west traffic through this territory into New England.

The western terminus of the Central New England is at Campbell Hall, N. Y., 30 miles west of Poughkeepsie. Besides being on

east, instead of northward over its main line which has exceptionally bad grades and alignment, traffic is turned southward over a 13-mile branch to Hopewell Junction, the western terminus of the New Haven's Highland division over which there is connection with all New Haven territory to the eastward. Thus the Highland division becomes part of a new through route between New England and the anthracite coal fields and the West. As before, freight is also received at Fishkill Landing and reaches the Highland division over the Newburg, Dutchess & Connecticut to Hopewell Junction.

With the establishment of the new through route it was necessary that the division should be put in shape to handle modern heavy traffic. What is now the Highland division, extending from Hopewell Junction, N. Y., east to Willimantic, Conn., was formerly the western end of the New England Railroad, which connected Boston and Fishkill and was leased to the New Haven on July 1, 1898, control having been acquired some three years earlier. The Hudson river extension of this road, from Waterbury to Fishkill, was opened



Poughquag Cut Before Being Widened for Double Track, Highland Division, N. Y., N. H. & H.



Highway Undercrossing near Brewster; Highland Division, N. Y., N. H. & H.

late in 1881. It is single track and never received any extensive improvements. Consequently its practical reconstruction to meet the demands of present and expected traffic has involved the substitution of present-day standards for those of 25 years ago.

The first section undertaken was from Hopewell Junction to Danbury, 34.6 miles. The accompanying photographs give an idea of the nature of the work. A condensed profile of the line from Hopewell east to Towners, 19 miles, is also given, showing the principal and maximum gradients both east and westbound over this section. About eight miles east of Hopewell is Poughquag cut, shown in the photograph, which was taken at the time the cutting for double track was begun. The cut is from 65 to 75 ft. high; the rock, shale. Excavation for the second track amounted to 38,000 cu. yds. The work was done without serious mishap, and with slight delay to trains, the only important accident being that of a foreman who fell off the top of the cut near the derrick shown in the photograph. However, in a week's time he was at work again. The 7-deg. curve through Poughquag cut is the maximum on this section, the sharpest curve between Hopewell and Danbury being, with this exception, 5 degrees. Just before reaching the summit the road skirts Whalley pond on the south side. There is a swamp on the north side of the track at this point. About 35,000 yds. of



Twenty-Foot Concrete Arch for Stream near Towners; Highland Division, N. Y., N. H. & H.

bound the grade is heavier, reaching a maximum of 1.38 per cent., or 72 ft. to the mile. The foot of the grade is near Towners, five miles east of the summit.

In the vicinity of Towners a great deal of work has been done. The most important of this is the filling in of a long wooden trestle for about 1,500 ft. on each side of an overhead bridge over the main track and a siding of the Harlem division of the New York Central and the rebuilding of this bridge. The filling of this trestle requires about 125,000 yards, the material being all taken out of a cut east of Towners. A photograph shows the original situation at the crossing over the Harlem tracks. The new bridge, a photograph of which is also shown, is a double-track through truss steel bridge, 181 ft. long, on a skew of 26 deg. The New Haven tracks have been raised 4 ft. to give head room of 21 ft. over the Harlem tracks. The old wooden trusses shown in the earlier photograph have been in service over 25 years, and the timber when taken out was in as good condition as when built. The new masonry is built entirely in concrete resting on piles. About 4,000 yds. of concrete were required.

Just before reaching this overhead bridge there were formerly two bridges, near together, each over a highway. Here a new bridge, with a skew of 65 deg. and a 30 ft. 6 in. girder, replaces these two bridges, under which, by a slight shifting and joining of the highways, the two roads run. East of the overhead crossing is a 20-ft. concrete arch, a photograph of which is shown. This has been built to take a stream flowing under the Towners trestle, which is being filled in. The land here is swampy, and the stream ordinarily



Old Bridge and Trestle Over Harlem Tracks at Towners; Highland Division, N. Y., N. H. & H.

rock and 65,000 yds. of earth were dumped here before obtaining a firm bottom for the new track. The water along the track is about 5 ft. deep and the mud about 40 ft. deep below that.

Reynoldsville Summit is 750 ft. above sea level, the highest point on the old New England Railroad. Hopewell is 285 ft. above the sea. The eastbound grade, as shown by the diagram, rises to a maximum of 1.22 per cent. (64 ft. to the mile) between Hopewell and the summit, 12.6 miles east. Originally the pusher grade extended all the way to the summit, but in the reconstruction of the line the grade near the summit was cut down so that pushers can now cut off at West Pawling, the maximum grade on the remaining two miles to the summit being a short stretch of 0.75 per cent. (39 ft. to the mile). Great efforts were made to find some lower grade across this range of hills, which runs parallel to the river, but without success. New surveys were made for 15 or 20 miles both north and south of Reynoldsville, but no better location for a line than the original New England location was discovered. Fortunately the eastbound grade, which opposes the heavier traffic, is not as steep as the westbound, so that with the aid of one pusher fairly long trains can be operated eastbound over the summit. It is possible to haul from 30 to 40 loaded cars up the grade with one helper, though the ordinary train is somewhat lighter. This 10-mile grade with a maximum of 1.22 per cent. is a factor which must always be reckoned with in any consideration of the New Haven's through route via the Poughkeepsie bridge. Against the lighter traffic west-



New Bridge Over Harlem Tracks at Towners.



Old Single Track Bridge Over Croton River at Brewster; Highland Division, N. Y., N. H. & H.

has little or no flow, but at times is large enough so that this size arch is necessary. The four wings of the arch are each 24 ft. 4 in. long. It is built on piles, unlike the highway bridge, where piles were not necessary. This arch is all concrete except the ring, which is of cut stone. East of Towners there is a down grade of 1.12 per cent., with the bottom of the hill near Crotons, which is 438 ft. above sea level. Near Dykeman the east-bound grade has been cut down from about 60 to 36 ft. per mile.

At Brewster there is another heavy piece of bridge reconstruction. The bridge over the Croton river, as it originally existed, is shown in one of the photographs. The masonry was built for double-track, but allowed for only 11 ft. centers. As the new tracks will be 13 ft. centers, this necessitated practically rebuilding the entire masonry. Two views of the work as it is at present are shown. The new masonry has been built in concrete, 5,500 cu. yds. of which were used. The iron work consists of two deck spans each 134 ft. long. As it is at the bottom of a sag (1.25 per cent. on the west and 0.67 per cent. on the east), the bridge is being raised 10 ft. above its present level, which will make the grade better and at the same time prevent the extreme shock with which a heavy train coming down the grade now hits the bridge. The base of rail on the new bridge will be 65 ft. above the bed of the stream. The total distance between parapets is 268 ft.

Another photograph shows the masonry built for a highway under-crossing near the village of Brewster. A long retaining wall

track. The work from Hopewell to Danbury was divided into five sections. From Hopewell four miles east the work was done by the road's maintenance of way forces. From this point west to Stormville C. W. Blakslee & Son, of New Haven, had the contract. From



Reconstruction of Bridge Over Croton River at Brewster—Present State of Work.



Reconstruction of Bridge Over Croton River at Brewster—Present State of Work.

was here necessary, on account of the skew on the highway. A short distance west of Brewster is the Connecticut State line. At Storm's Crossing, which marks the line, a new concrete overhead highway bridge has been built.

In Danbury a good deal of new work has been done. A new masonry bridge was built over West street. To replace a wooden trestle at one point where it was necessary to leave, in addition to a street opening, another opening underneath, in order to give access to one of the hat shops, and at the same time leave head room of 13 ft., five masonry piers were built supporting the tracks on a curve. A new concrete bridge was built east of the hat factory opening, where the channel of a stream has been changed. Here a new double-track trestle is to be built, replacing the present single-track trestle. On the south side of the right of way a long piece of retaining wall was built right up to the property line to hold up the new track. All bridges in Danbury have been made wide enough so that if grade crossings are abolished the bridges can be easily raised. Where they are on curves, copings have been inclined for the super-elevation of the outside

Stormville to Reynoldsville Summit the contractor was J. W. Daly, of New Rochelle. From Reynoldsville to Brewster the Blakslee firm was the contractor, and from Brewster to Danbury, J. W. Daly & Co. The work from Stormville east to Towners was begun in December, 1904, and from Towners to Danbury in April and May, 1905. All of the double track between Hopewell and Danbury is now in operation, with the exception of about six miles from Towners to Brewster, and the last two miles into Danbury. Throughout the whole extent of the work numerous bridges over streams were replaced with arches, others rebuilt, girders substituted for wood on highway bridges, and culverts extended for second track. There were also 10 or 12 small bridges taken out and the openings filled in. It is noticeable that on this work there are a great many skew bridges. Where masonry was used, considerable difficulty was found at first in getting the stones for these skews cut to proper shapes. Finally, in some of the more difficult work, wooden blocks were made as a model for the stone-cutters. Passing sidings on the line have been extended where necessary to make a 2,500-ft. clearance.

It may be interesting in connection with the rebuilding of the division to consider the sources of its through traffic. As already

explained, at Maybrook the Lehigh & Hudson River connects with the Central New England. Already this road turns over to the C. N. E. a considerable tonnage received by it, in particular from a connection completed late last year with the Delaware, Lackawanna & Western. The Lehigh & Hudson River is favored in making these interchange shipments from the Delaware river region rather than the Lehigh & New England, which is also under the control of the Lehigh Coal & Navigation Company. In order to increase the amount of through traffic from the West received over the Ontario & Western, the Ontario Central Dispatch line, which runs over the New York, New Haven & Hartford, New York, Ontario & Western, Michigan Central and Big Four railroads, was in February organized. Since the establishment of this fast freight line there has been a considerable increase in shipments by this route, and consequently in the use of the New Haven's Highland division. An idea, though not an accurate estimate, of the amount of traffic handled can be gained from the number of regular freight trains which are run over the Highland division east from the Hudson river. From Fishkill Landing there are three daily regular first class freight trains which run to Hopewell and thence east via Danbury. One of these is a Boston and another a Providence freight. In connection with these trains, the New York Central & Hudson River runs a daily train from East Buffalo to Fishkill Landing, carrying beef, perishable freight and high-class merchandise for points on the New York, New Haven & Hartford, connecting with the Boston train, and two solid trains from West Albany to N. Y., N. H. & H. points via Fishkill Landing for connection with the Providence train. In addition to the three first-class freight trains east from Fishkill Landing there are four regular second-class freight trains, two of them Boston freights, from Fishkill Landing, and three regular second-class freight trains, one of them a Boston freight, from Campbell Hall and Poughkeepsie. Thus the present regular traffic east-bound over the Highland division is made up of 11 regular freight trains, in addition to as many extras as may be run. That a large increase of traffic via Campbell Hall and Poughkeepsie is expected is shown also by the fact that a contract has been made with the American Bridge Co. for reconstruction, at a cost of about \$1,000,000, of the Poughkeepsie bridge over the Hudson river.

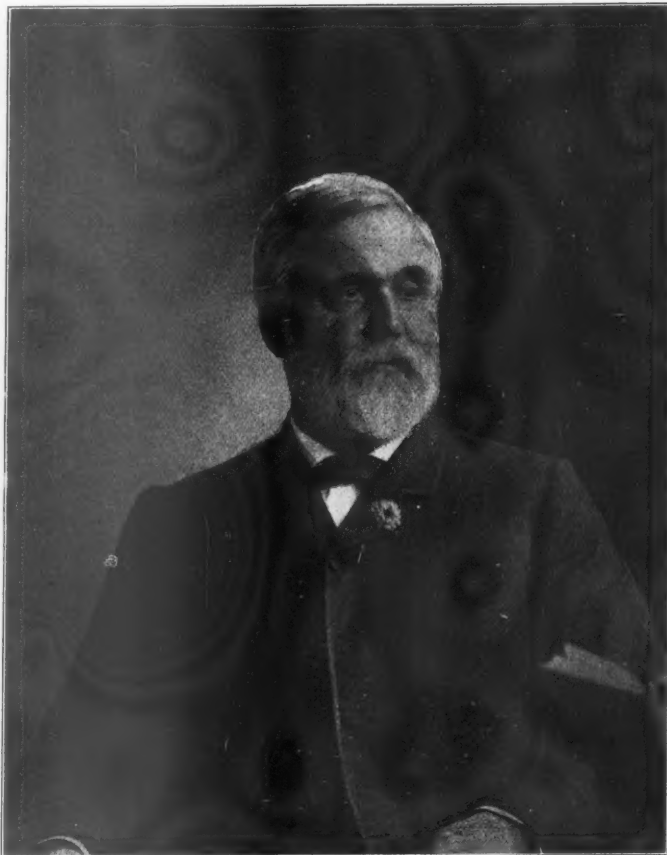
Now that the double-tracking of the section from Hopewell to Danbury is nearly finished, rebuilding work has been pushed further to the eastward. Reconstruction of the section from Waterbury east to Bristol, 15 miles, was begun this spring. Much of this is very heavy work, involving considerable change of line, which will result in saving two miles of distance. About four miles from Terryville east to Bristol, and two miles from Hancock east to Tolles, is to be entirely new line. There is to be built a 3,500-ft. tunnel on the new location, and 1,200 deg. of curvature will be taken out. The 14 miles of new work will involve approximately 580,000 yds. of earth and 260,000 yds. of rock excavation. In comparison with the 30 miles of work between Hopewell and Danbury, which cost \$1,200,000, this 14 miles will cost \$1,700,000.

For the information in regard to this work we are indebted in particular to Mr. Edward Gagel, Chief Engineer, and to Mr. F. M. Smith, Assistant Engineer in charge.

Nemjeshajev, who succeeded Prince Hilkoff as Russian Minister of Transportation when Witte formed a cabinet, went out with Witte, and was succeeded by Maj.-Gen. von Schaffhausen-Schönberg-ek-Schauffuss, who is an engineer by training, has been a railroad manager and for some time has been attached to the department of which he is now the head.

Charles Paine.

Charles Paine, who died at his farm near Tenafly, N. J., on July 4, was born in Haverhill, N. H., April 25, 1830. When he was 15 years old he was a rodman on the Vermont Central, where he stayed four years, becoming division engineer in charge of construction. He was a division engineer on the Vermont & Canada and Engineer and Manager for the contractor on the reconstruction and extension of the Champlain & St. Lawrence. Later he went West and served as Chief Engineer of different railroads in Wisconsin. He became a Division Superintendent on the Michigan Southern & Northern Indiana. He served successively as Engineer of the Western division, Chief Engineer and as General Superintendent of the Lake Shore & Michigan Southern. His services on that road and on the Michigan Southern & Northern Indiana covered 23 years. He left the Lake Shore to become General Manager of the New York, West Shore & Buffalo, where he stayed during the entire period of building. The unfortunate termination of the enterprise left him without employment, and he spent a year traveling in Europe for rest. In 1885 and 1886 he was General Superintendent of the New York, Pennsylvania & Ohio and Vice-President of the Erie; then for about five years he was Vice-President and General Manager of the Philadelphia Co. in Pittsburgh, engaged in developing the principal natural gas interests of that region. From 1891 to 1899 he was in private practice as a consulting engineer and was employed in a confidential capacity on the Erie during the period of its reorganization, and as General Manager of the Union Steamship Co. for the Erie. In 1899 he became General Manager of the Panama Railroad and left it when the United States Government bought it. He was a Past President of the American Society of Civil Engineers, an Honorary Member of the Western Society of Engineers and of the Civil Engineers' Club of Cleveland, a member of the American Society of Mechanical Engineers and of the Century Club of New York.



Charles Paine.

Mr. Paine's character was of a type that is now infrequent. We read of such men in the Bible and in some other books, men who were invulnerable to every form of temptation that can come to a man of position and power. We have such men now; we hope for more of them among corporation officers in the future, for sturdy moral character in a severely tempted man is an accomplishment usually got under stress of public opinion. He was a

learned man, with fine literary tastes and capacity for expression; a sound engineer of good judgment; and a safe railroad officer who enforced discipline and inspired loyalty. He never refused to see inventors or sellers of railroad devices, but he made his decisions rather quick and final. It was while he was engineer of the Lake Shore that he first met George Westinghouse, then little more than a lad, who called on him and got a sample order for an improved frog. It was a good frog, and from time to time Mr. Paine ordered more of them, and talked with and encouraged young Westinghouse in his studies for a practicable form of continuous train brake. The friendship then formed lasted through life.

Mr. Paine was for many years a not infrequent writer for the *Railroad Gazette*, not so often over his own name as in editorial discussion and expression of opinion. He was a suggestive and safe adviser for its editors; and his book, "The Elements of Railroad-ing," consists wholly of reprints of some of these articles. It is a small volume which has had a wide reading, a model of accuracy, simplicity and condensed statement. Since retirement from the Panama railroad service Mr. Paine has led, up to the time of his painless death, an ideally happy quiet life at Tenafly, with his children and grandchildren often gathered together.

Mrs. Paine should not pass unnoticed in this memorandum, for she was so much a part of his life that in literary and artistic tastes and appreciations, in manner and form of expression, in ways of thinking, they so grew in each others lives as to be astonishingly alike. A casual observer would say that they looked alike. This is impressive now in the large photograph of Mr. and Mrs. Paine, made for the writer 15 years ago, and from which the engraving here shown is taken.

In estimating the sum of good work done for the world by Mr. Paine, we find no record of great achievement in engineering, finance, invention or any radical improvement in railroad methods. His monument is a correct and blameless life in positions of great responsibility, and the men he has encouraged, advised and trained in uprightness and thoroughness. One officer said a short time ago: "The country is full of Paine's men, and they are the best railroad officers we have."

W. H. B.

Organization of the Pennsylvania Railroad, 1906.

In the *Railroad Gazette* of April 27, 1900, there was printed a diagram of the organization of the Pennsylvania Railroad Company as it existed at that time. Since then some notable changes have been made, and the diagram accompanying this article illustrates these changes. In 1900 there were but three vice-presidents. At the present time there are five, and their respective duties and responsibilities have been much shifted about.

The first vice-president in 1904 had under his supervision three main divisions—that covered by the work of the third vice-president, that covered by the general passenger agent, and by the general freight agent. The third vice-president at that time was reported to by the chief engineer, chief of motive power, general manager, purchasing agent, superintendent of insurance department, and the real estate agent. The first vice-president was therefore directly responsible for traffic and indirectly responsible for transportation, the mechanical department, the engineering department, and several others as well. At the present time the first vice-president has collateral supervision over the work of the fifth vice-president, who is in charge of the treasurer's department only, and he has direct responsibility for the comptroller's department, including all the auditors. This work was done by the second vice-president under the former organization.

The second vice-president in 1906 is the operating man, reported to by the general manager, and also by the motive power and engineering departments. It has evidently seemed wise to consolidate the tremendous responsibilities attached to these widely separated functions under one roof for ultimate guidance, although it is scarcely necessary to point out the very able support which the vice-president receives from his general manager, his chief of motive power, his chief engineer, and his general superintendents.

The third vice-president in 1906 has several unusually diversified duties to perform, but it may be said that his chief work is that mentioned in the second grouping of duties under his title—the promotion of new lines and corporate work connected therewith, having particular reference at the present time to the New York tunnel extension.

The fourth vice-president is the traffic manager, and the fifth vice-president, as already mentioned, has charge of the treasurer's department.

On account of the tremendous concentration of all that is directly connected with operation in control of the second vice-president, it will be seen that the Pennsylvania furnishes the strongest possible example of a divisional organization. The diagram shown accompanies an interesting address on the incorporation and organization of the company, delivered before the Transportation Class of the Pennsylvania Railroad Department of the Young Men's Christian Association in Philadelphia by A. J. County, Assistant Secretary. In this address Mr. County goes into considerable detail with regard to the incorporation and past organization of the company, and also discusses somewhat fully the organization of the present time. The following table which he gives shows the growth of the principal departments in the management of the company, although it does not describe the breaking up of these departments into separate vice-presidencies in the manner we have discussed:

1846	Charter officers—president, secretary, treasurer.
1847	Executive, secretary's, treasury and engineering departments.
1852	Transportation, freight, passenger and accounting departments.
1856	Legal department.
1863	Motive power department.
1866	Purchasing department.
1869	Maintenance of way department.
1874	Real estate department.
1878	Empire line.
1879	Insurance department.
1886	Voluntary relief department.
1888	Employees' saving fund.
1893	Telegraph department.
1900	Pension department.

The following abstract is made from comments in Mr. County's paper on the division of responsibility throughout the system:

The entire supervision and direction of the affairs of the company are vested in the president. Assisting him in the performance of his duties the first vice-president exercises general supervision over the treasury, accounting and saving fund departments. This is a weighty responsibility, and therefore, so far as the affairs of the accounting department are concerned, the third vice-president assists him, and acts for him in his absence, and the fifth vice-president takes direct charge of the operations of the treasury department, and also acts as treasurer of the company. The principal duty of the treasurer is the custody of the money and securities of the company, and of all matters connected therewith. His staff of assistants are three assistant treasurers, an assistant to treasurer, a cashier and two registrars of the company's bonds.

The accounting department audits all the books and accounts of the company, and maintains and enforces the methods of keeping the same, and is in charge of the comptroller, whose official staff consists of an assistant comptroller, assistant to comptroller, auditor of merchandise freight receipts, auditor of coal freight receipts, auditor of passenger receipts, auditor of miscellaneous receipts and accounts, auditor of disbursements, auditor of the Empire Line, and an auditor of the Union Line.

The titles of auditors give a very fair indication of the scope of the accounting department, and these auditors have assistants.

The third branch, operation and transportation, is concerned with the prompt and economical movement of the traffic, and includes the building, as well as the maintenance, of the railroad and its facilities for that purpose. This comes under the jurisdiction of the second vice-president, who assists the president by exercising special supervision over the engineering and transportation departments, and has general supervision over the purchasing, real estate and insurance departments. Here again there is a concentration of responsibility requiring a large staff of officials. The assistant to the second vice-president is required to possess an intimate knowledge of the business of the various departments under the second vice-president to efficiently assist that officer. The chief of motive power exercises general supervision over the motive power department so far as it may be necessary to preserve the motive power standards and the systems of the company, and the plans for rolling stock. The condition and capacity of the shops and facilities for the maintenance of equipment are subjects upon which he must keep himself informed, and also as to the purchase of necessary tools and machinery. The record of patents and the organization of car trusts, and the records of equipment purchased through car trust, also come within his province.

The chief engineer has charge of all engineering and construction work, and the preparation of the plans, specifications and estimates for all of the railroads owned or operated by the company, as well as for new bridges and the improvement of buildings. He also keeps in his office a detailed record of the cost of all new work chargeable to construction account, and has charge of the distribution of steel rails for construction and renewals. His official staff consists of an assistant chief engineer, an assistant to the chief engineer, an engineer of bridges and buildings, and an engineering corps in the field. When the work of this officer is completed the structures are turned over to the transportation or operating department, of which the general manager is the active working head and responsible therefor to the second vice-president.

The general manager assists the second vice-president, and is given charge of the operations of the transportation department, being specially concerned in the safe and economical management of the entire system of railroad lines and facilities. An idea of his duties may be gathered from the titles of his large staff, namely, general superintendent of transportation, general superintendent of motive power, chief engineer of maintenance of way, superintendent of telegraph, four general superintendents and one terminal superintendent, three general agents, a purchasing agent and a real estate agent.

The general superintendent of transportation has general supervision of the movement of traffic and of the distribution of the car equipment. He is assisted by the superintendent of freight transportation and the superintendent of passenger transportation.

The general superintendent of motive power has direct supervision and control of the motive power department, so far as to insure the efficiency of all locomotives, cars, shop equipment and machinery. He keeps a record of the performance of all of the rolling stock and shop equipment, and makes recommendations for the efficient and economical operation of that part of the service which comes under his supervision.

The chief engineer of maintenance of way is in direct charge of the maintenance of way department, and the preservation of standards. These are vital points in the operation of a system as large as ours, in providing the most substantial roadbed for the economical and safe movement of heavy traffic, for which a uniform standard of maintenance and supplies and the methods of using them on every division is at the root of railroad progress. In addition, this

officer is obliged to keep in touch with all scientific and practical developments in the maintenance matter all over the world, so that the company may benefit therefrom. He is aided by an engineer of maintenance of way.

The superintendent of telegraph has general supervision of the construction and maintenance of telegraph and telephone lines, and the supplies therefor. This is one of the newest offices under the organization, which the progress of quick communication in modern railroading has made a necessity.

The railroads owned, leased and operated by the company are divided into four general divisions, each in charge of a general superintendent.

The general superintendents have charge of all right-of-way, buildings, property and equipment on their respective general divisions. They are responsible for the maintenance of the track and the discipline of employees, and the safe and economical movement of all trains and the maintenance of the service at the proper standard of efficiency. Each general superintendent is assisted by division superintendents, a principal assistant engineer and a superintendent of motive power.

The principal assistant engineer assists the general superintendent in maintenance of way matters. The superintendent of motive power has charge of the shops and of the maintenance of the equipment, tools and machinery, but the orders relative to shop discipline, increase or decrease of the working forces or changes in wages are issued by the respective division superintendents. He is assisted by a master mechanic, and at the car shops by a foreman of car repairs, who are responsible to him for the economical execution of the work of repairing and rebuilding locomotives and cars.

The division superintendents exercise on their respective divisions all the powers of the general superintendent necessary for its proper management. They are responsible to the general superintendent for the maintenance of the tracks, bridges and buildings, the movement of trains, the discipline of employees and the increase or decrease in the working forces and the rate of wages. The division superintendent is assisted by an assistant engineer, who takes special charge of the maintenance of the roadway, tracks and buildings, but the number of heads of sub-departments attached to the staff of each division superintendent to reach the bottom of the ladder is so great that the organization does not attempt to define their duties, and accordingly we must look to the book of rules, and there we find they consist of:

Supervisors.—Report to assistant engineer. They have charge of repairmen and other laborers on their respective sections, and are responsible for track and roadbed, bridges, culverts, telegraph lines, and everything pertaining to roadway. The employees subordinate to them are track foremen, laborers, road and bridge watchmen, signalmen and switchmen.

Supervisors of Signals.—Report to assistant engineer and have general charge of the maintenance and repair of switches and signals operated in connection with telegraph towers.

Master Carpenters.—Report to assistant engineer. They have charge of repairs of bridges and other structures, and employ workmen necessary therefor under approval of assistant engineer.

Train Masters.—Report to superintendent, and have charge of the movement of traffic and supervision of trainmen.

Yard Masters.—Report to train masters.

Passenger Conductors.—Report to train masters, and must obey orders of station masters, and conform to instructions issued by accounting, passenger and treasury departments.

Passenger Brakemen.—Report to train master. While on duty they are under the direction of conductors, and at stations must obey the orders of station masters.

Baggage-man.—Report to train master.

Freight Conductors.—Report to train master, and must obey orders of yard masters.

Freight Brakemen.—Report to train master and must obey orders of yard masters, and when on trains those of conductors.

Train Despatchers.—Report to superintendent and issue telegraphic orders for the movement of trains in the name of superintendent. In the absence of the division operator they have charge of operators.

Division Operator.—Reports to superintendent.

Telegraph Operators.—Report to division operator, and in his absence to the train despatchers. At stations they obey the orders of the station masters or station agents.

Telegraph Repairmen.—Report to division operator.

Levermen.—Report to division operator.

Station Masters.—Report to division superintendent, and must obey orders of the train master.

Station Agents.—Report to the superintendent. They must conform to the instructions issued by the passenger, freight, accounting and treasury departments.

Baggage Agents.—Report to superintendent. Must obey orders of station masters or station agents, and conform to instructions issued by passenger and accounting departments.

Road Foreman of Engines.—Reports to superintendent.

Enginemen.—Report to road foreman of engines, and must obey

orders of the train masters, and of station masters and yard masters as to shifting and making up trains; and when running are under general control of conductors as to the care and prompt movement of trains. When at the round houses they are under the direction of engine house foremen.

Firemen.—Report to road foreman of engines. Must obey orders of train masters, and when at the engine house are under direction of engine house foremen; when on duty they must obey the order of enginemen.

Master Mechanics and General Foremen of Car Shops.—Report to superintendent, and must obey orders of superintendent of motive power.

Engine House Foremen.—Report to master mechanics.

Shop Clerks.—Report to superintendent, and must obey orders of the master mechanics or general foremen and make reports as directed by accounting and motive power departments.

Foremen of Car Inspectors.—Report to superintendent, and must obey orders of superintendent of motive power, or station or yard masters.

There is one division superintendent who reports directly to the general manager, namely, the superintendent of the Philadelphia Terminal division, who has the same general responsibilities as the other superintendents. He has supervision of the freight and passenger stations, the movement of trains and the maintenance of the tracks in the Philadelphia Terminal district and other business and commercial interests affecting that district. His duties partake of a double nature, viz., that of the division superintendents and the general agents.

General agents are appointed for the cities of New York, Pittsburgh and Erie, and assist the general manager by taking charge of the freight soliciting agencies, and the large freight and passenger stations and employees connected therewith in those cities.

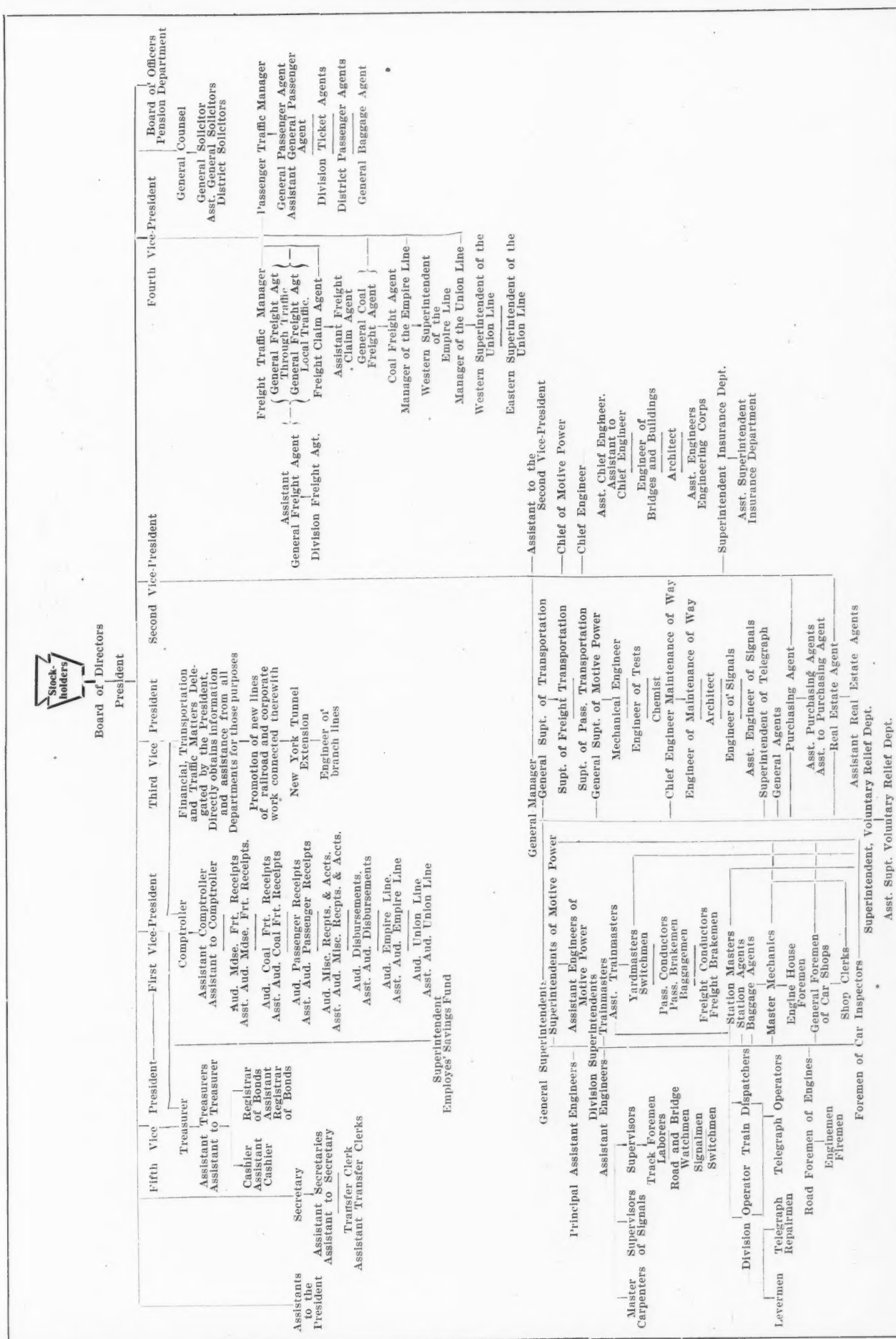
The second vice-president exercises general supervision over the purchasing agent and real estate agent, and yet these officers are also on the staff of the general manager. This is because their duties necessarily bring them into very close and constant touch with the general manager in the operation of the railroad.

The purchasing agent has charge of the department which purchases all supplies required for the company's use, and must keep in communication with the heads of all departments so that the stock of materials and supplies may be ample not only for the present but also for the future needs of the company. This necessitates a knowledge of general outside market conditions, so that supplies may be purchased at the most economical prices, and that there shall not be too much of the company's money invested in a large stock of materials for which the company has no immediate use.

The traffic department is in charge of the fourth vice-president, who assists the president by supervising the procurement and development of traffic for and upon the lines of the company, and exercises special supervision of the freight and passenger departments, and takes special charge of traffic relations with competing and connecting lines. The staff of the vice-president in charge of the traffic department consists of a freight traffic manager, a general coal freight agent, a manager of Empire Line, manager of Union Line, and a passenger traffic manager.

The managers of the Empire and Union lines are in charge of two fast freight service lines owned by the company, and take general control of their operating officers and agents, and their arrangements with other railroad companies, so as to develop the through traffic. Both of these fast freight lines are valuable to the company on account of their traffic agreements and relations with other roads. Years ago such independent agencies were a common feature, because at that time it was almost impossible to secure a fast movement of through freight on account of the conflicts which existed between competitive railroads, who very often declined to haul the cars of their competitors; and these through freight lines not only furnished the rolling stock, but also avoided the transferring of freight from the cars of one road to that of another at terminal points. Both these officers are assisted by superintendents and agents in charge of districts.

The aim of the organization thus far has been to assign several departments to each vice-president, but with the growth of the company, especially during the past ten years, the burden caused by the increased duties pertaining to these departments became so great that it was decided that there should be one vice-president in a position to consider and deal with matters pertaining to any of the principal branches of the organization, namely, finance, transportation and traffic, as the president should deem expedient, and to enable such vice-president to effectively act in that capacity he was given authority to directly obtain such information and assistance from any officer or department as might be deemed necessary in the discharge of such duties. This arrangement was for the purpose of increasing the flexibility of the organization, in addition to affording much needed relief to the vice-presidents and the president. This officer is designated the third vice-president, who in addition to this wide scope of duties has general charge of the promotion of new lines of railroad in which the company is interested, and the corporate work in connection therewith. He also assists in matters



Organization of the Pennsylvania Railroad Company, 1906.

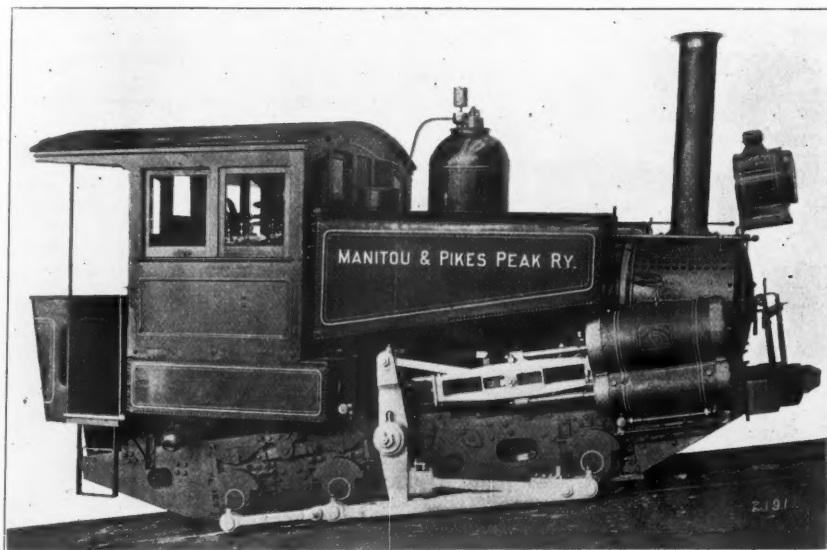
connected with the accounting department. To the third vice-president has been committed the charge of the construction work of the New York tunnel extension and the many questions incident thereto. The engineer of branch lines assists him in the discharge of his duties relating to the construction of branch lines of railroad and corporate work connected therewith. In the New York tunnel work he has a corps of chief engineers and assistants to aid him.

The legal department and secretary's department are primarily under the supervision of the president, and yet receive instructions from, and perform duties for, the executive heads of all of the other departments, and this is offered as one explanation why they are not entirely placed under the supervision of any single vice-president. For the relief of the president the nominations of all officers in the secretary's department must receive the approval of the first vice-president, and with the approval of the latter officer the secretary appoints all necessary employees in his department. The primary duties of the secretary are as an officer of the board, being responsible for a true record of the proceedings of the board and the standing committees. The office of the secretary is included within the executive department because the secretary is the channel through which the various officers are notified of the actions of the board pertaining to their departments, and of the execution of all contracts and other papers involving the interests of the company. The issue and transfer of the capital stock, and the books showing its ownership, are under his charge. He also is the custodian of the originals of the agreements and patents and other valuable documents, and takes charge of that portion of the machinery which gives notices of stockholders' meetings and elections, so that he is the agency through which the corporate work of the company begins in each year. He also takes charge of the general office building, of the necessary repairs thereto and the heating and lighting thereof. He is assisted by three assistant secretaries, an assistant to the secretary, and a stock transfer clerk. Another officer embraced in the executive department is the general counsel, who is the head of the legal department and has charge of all of the company's litigation. In this responsible work he is brought into touch with every department, and the heads of nearly every department find it essential to consult with him from time to time. The general counsel supervises the preparation of all contracts and bonds and furnishes opinions upon any subject referred to him by the president or board. His duties are far-reaching, and the wisdom of a competent legal advisor is an important element in the successful conduct of the company's business. He is aided by a general solicitor, two assistant general solicitors, located in the general office, and by district solicitors, residing in various cities along the company's lines.

In this organization sketch I have not considered the companies allied to the Pennsylvania Railroad, but do not forget that the duties of every officer is materially increased by the large number of corporations which are embraced in our system—the number of the companies east of Pittsburg being over 120—and in addition they act in an advisory capacity in other roads in which the company has an interest.

Rack Locomotive for Manitou and Pike's Peak Railway.

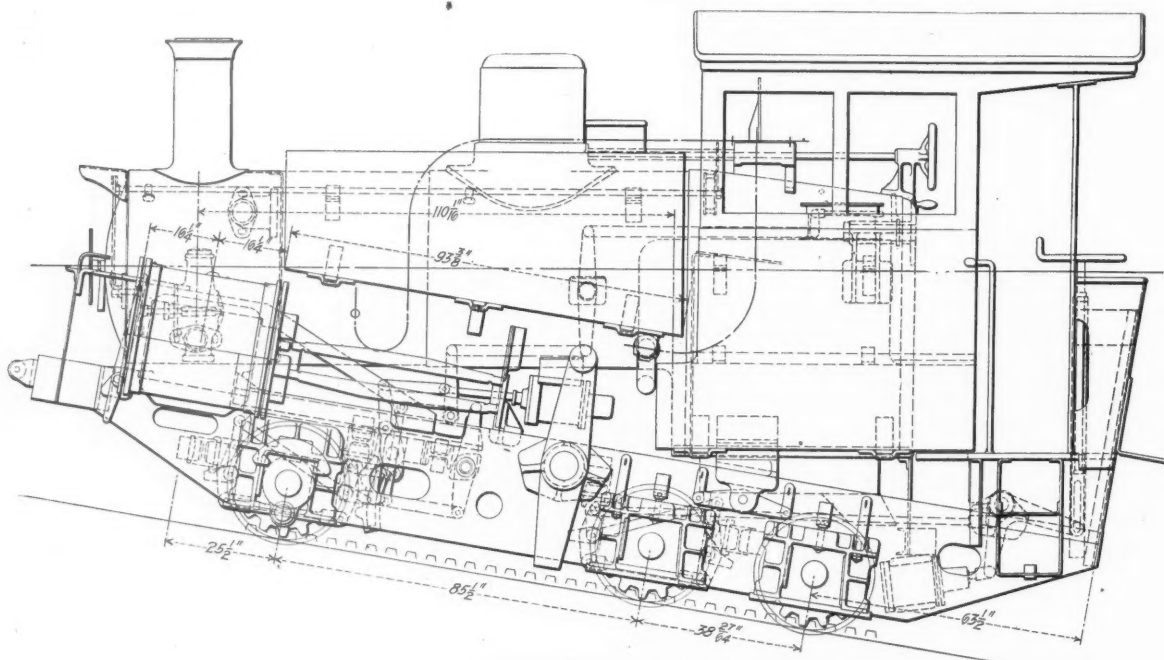
Early in 1891, the first locomotives were delivered to the Manitou & Pike's Peak Railway. They were not entirely satisfactory on account of the disagreeable vibrations set up. Accordingly, in the following year, engines of a slightly different design and of the Vauclain compound type were built. They were illustrated in the *Railroad Gazette*, Aug. 12, 1892. These engines had cylinders 9 in.



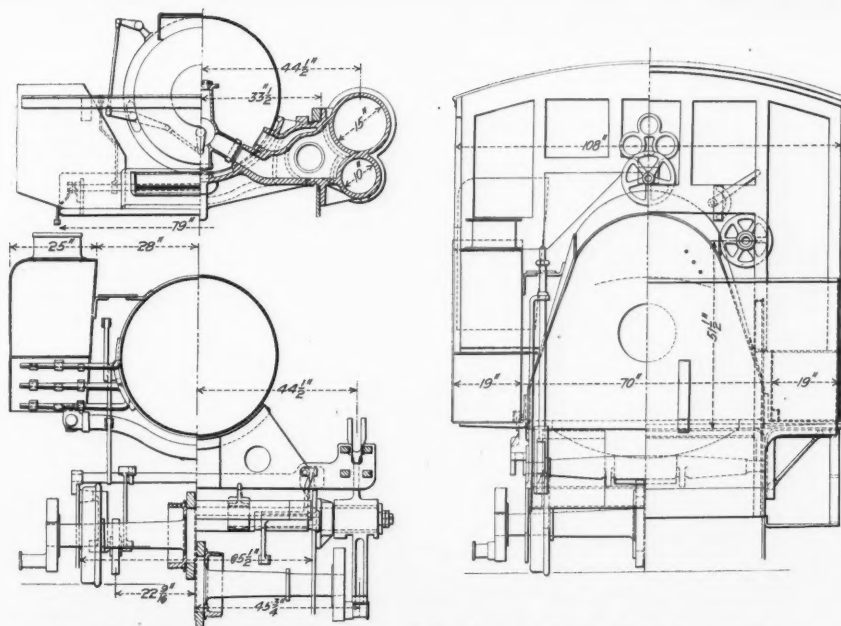
Rack Locomotive Built by the Baldwin Locomotive Works for the Manitou & Pike's Peak Railway.

and 15 in. in diameter, with a stroke of 22 in. There were two geared driving wheels, with the rear end carried on a trailing truck. The engine was built with an oscillating arm to which the connecting rod, reaching to the main crank pin, was attached. The braking arrangements consisted of a band steam brake applying to the main axle, a band brake applying to the same and a water brake applying to the cylinders.

The Baldwin Locomotive Works, by whom the earlier engine



Side Elevation of Rack Locomotive for Manitou and Pike's Peak Locomotive.



Cross-Sections and Rear Elevation of Manitou & Pike's Peak Locomotive.

was built, has recently completed another that possesses a number of interesting features, as shown in the accompanying illustrations.

The road is operated on the Abt rack-rail system, with a maximum grade of 25 per cent. The new engines resemble the earlier ones in the general features of the use of side tanks, three pairs of wheels and the Vaucrain system of compounding, but differ in that each of the three axles is fitted with a driving gear and in the use of oil for fuel instead of coal, while the high-pressure cylinders are of 1 in. greater diameter and 2 in. longer stroke.

The frames are of the plate type, 3/4 in. thick, and are outside the wheels. They are braced in front by top rails which are bolted to the cylinder castings as shown in the side elevation. The boiler is set so that the tubes, which are of steel, will be horizontal when the engine is upon a 16 per cent. grade, the cylinders being placed on an inclination of four in twenty-five.

The valve motion is of the Good type, with eccentric on the main or leading axle. The motion is indirect, the rock shaft being

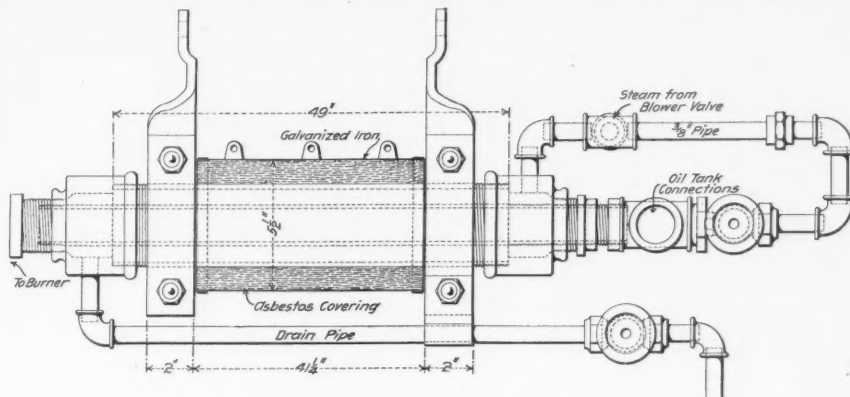
behind the links and between the frames. A screw mechanism is used for reversing.

The second and third pairs of driving wheels are equalized together, semi-elliptic springs being placed over the boxes. On the front wheels the weight is carried by rubber springs in the same position.

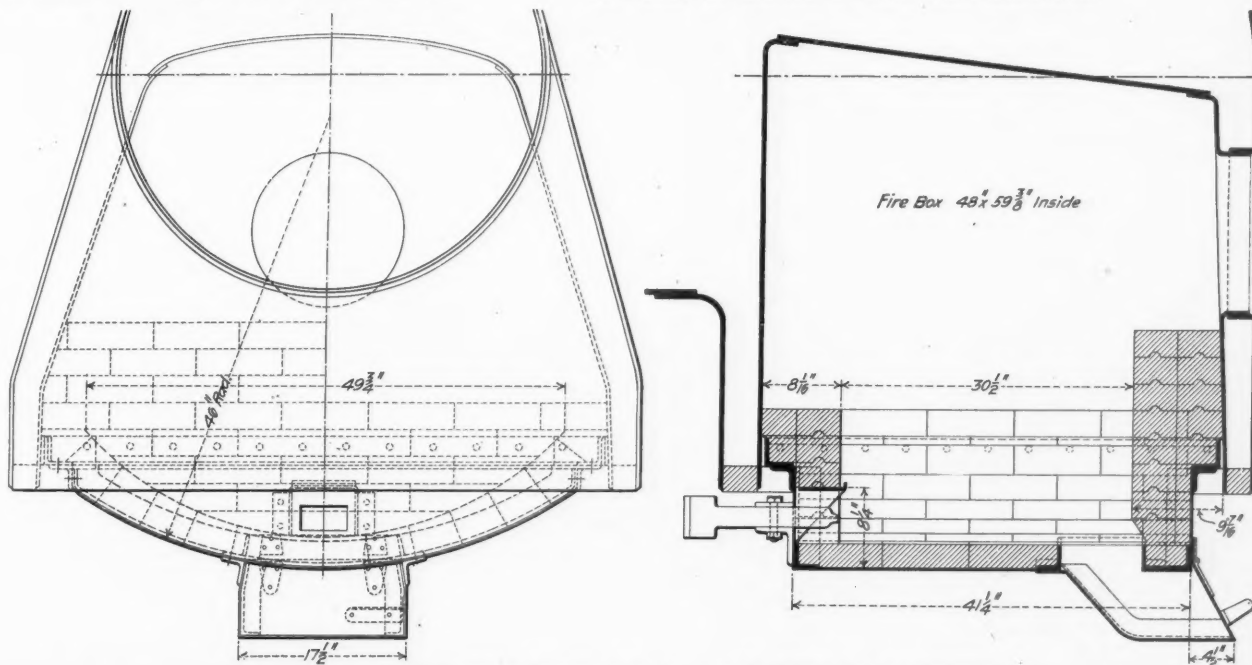
The oil tanks are on either side beneath the cab floor, and the oil is fed through a heater placed on the left hand side of the engine beneath the ash pan. This heater is formed by a 1 1/4-in. oil pipe inside a 3-in. pipe 4 ft. long. The space between these pipes is filled with steam, and the outer one is lagged with asbestos covering. The burner is of the same type as that used by the Southern Pacific Co. As shown in the engraving, it is placed under the mud ring, at the front end of the firebox, and is directed back against the fire brick lining at the rear, which is 9 7/16 in. thick over the back sheet. A damper with an opening of 9 1/4 in. admits air to the back. The floor of the firebox is protected by fire brick 2 1/2 in. thick and, contrary to the practice on coal-burning locomotives, has its greatest dimension across the engine.

The arrangement of the oil piping and the method of its regulation will be readily understood from an examination of the engravings by which it is illustrated. The oil

cock handle and the valve admitting steam to the heater are on the left hand side, conveniently located for the fireman. The oil feed-cocks are near the floor on either side and control the flow from the tanks near which they are respectively located, and from which the oil flows by gravity to the heater. The control of



Oil Heater for Manitou & Pike's Peak Locomotive.



Arrangement of Oil Burning Furnace on Manitou & Pike's Peak Locomotive.

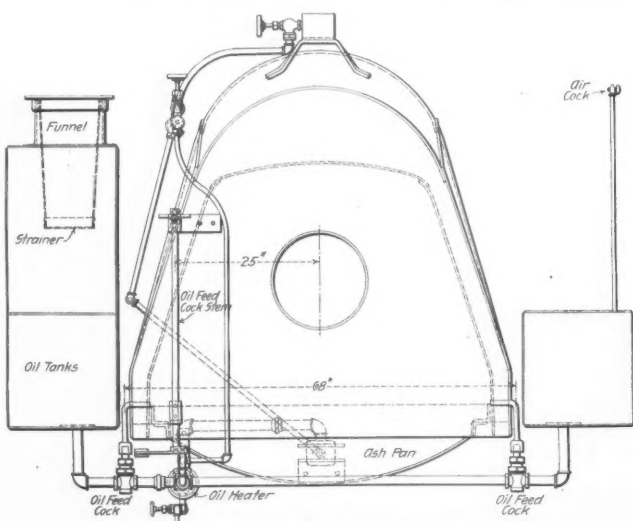
the actual injection of the oil into the firebox is effected by means of a valve operated by a connection running the breadth of the firebox from the back end, which is shown in the side elevation of the piping arrangement.

The engine is equipped with steam, hand and water brake. The steam and hand brake are of the band type, and operate upon the first and second driving axles respectively. The hand brake is also provided with an auxiliary steam cylinder by which it can be operated if so desired. The cylinder for the steam brake is set just ahead of the throat of the firebox and works through a lever shown in dotted lines in the side elevation. The auxiliary cylinder for the operation of the hand brake is set back of the rear driving axle and beneath the back end of the firebox. This works on the vertical arm of a bell crank, to the horizontal arm of which the hand application is made. The Le Chatelier water brake is operated by a valve placed on a level with the lowest gage cock.

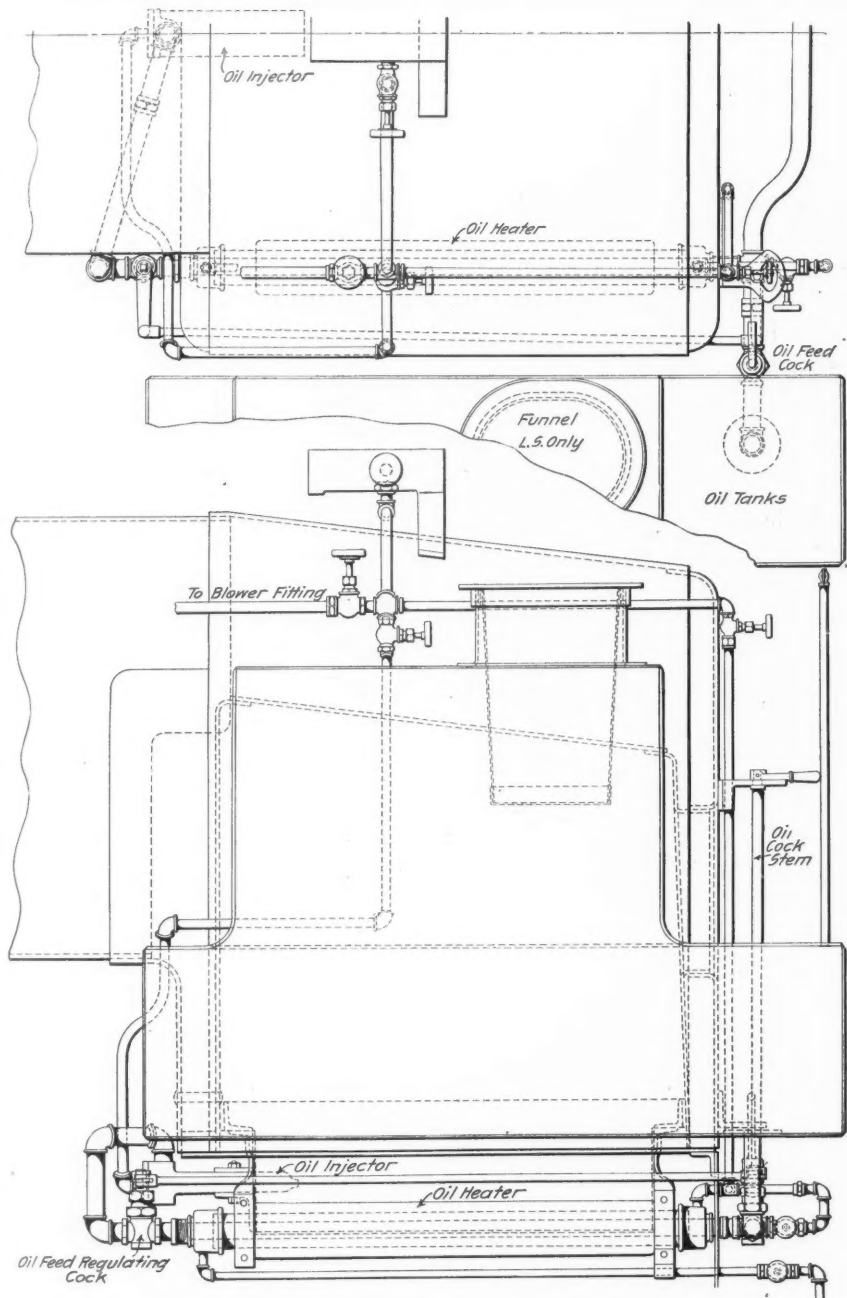
As shown in the cross section at the cylinders, the exhaust nozzle is fitted with a shut-off valve that is operated from the cab, so that air can be prevented from being drawn into the cylinders from the smokebox when the engine is reversed. The following are some of the principal dimensions of this engine:

Tractive power	25,284 lbs.
Cylinder diameter, H. P.	10 in.
Cylinder diameter, L. P.	15 "
Piston stroke	24 "
Steam pressure	210 lbs.
Fuel	Oil
Firebox, length	48 in.
" width	59 3/4 "
" thickness sides & back sheets	5-16 "
" thickness crown sheets	3/4 "
" thickness tube sheets	7-16 "
Water space, front	3 1/4 "
Water space, sides and back	2 1/4 "
Tubes, material	Steel
" number	176
" diameter	1 1/2 in.
" length	7 ft. 11 15-16 in.
Heating surface, firebox	58.3 sq. ft.
Heating surface, tubes	546.7 "
Heating surface, total	605.0 "
Grate area	19.7 "
Driving gear, pitch, diameter	22.465 in.
Driving journals, length	6 "
Driving journals, diameter	6 "
Wheel base	10 ft. 3 59-64 "
Weight	60,000 lbs.
Tank capacity, water	600 gals.
Tank capacity, oil	325 gals.

Weight on drivers	= 2.37.
Tractive effort	
Tractive effort x diam. drivers	= 938.85
Heating surface	
Heating surface	= 30.71
Grate area	
Firebox heating surface	= 0.96
Total heating surface	



Rear Elevation of Oil Piping Arrangement.



Side Elevation and Plan of Oil Piping Arrangement of the Manitou & Pike's Peak Locomotive.

Weight on drivers	= 99.17
Heating surface	
Volume of 2 H. P. cylinders	= 2.18 cu. ft.
Heating surface	= 277.52
Vol. 2 H. P. cylinders	
Grate area	= 9.03
Vol. 2 H. P. cylinders	

Welding Locomotive Frames.*

The first successful attempts to weld broken frames in place, that were given much publicity, were made on the Southern Pacific in California, following which the writer took up the idea and made many successful welds, using kerosene oil as fuel; gas can also be used. Each fracture requires its own detailed treatment; there cannot be any text-book examples laid down for others to follow. A break in a pedestal leg at the bottom, at the middle, near the top; in the upper or lower bar of the frame; over the driving-box; through a bolt hole; at the splice; horizontally, vertically, on a slant—each and every case requires its special treatment.

*Extracts from a paper by R. P. C. Sanderson, S. M. P., Seaboard Air Line, read before the M. M. Assoc., Atlantic City, June 18.

There are, however, governing conditions that rule in every case that should be understood.

To get a welding heat quickly with the least possible wasting away or burning of the metal, the oil or gas flame must be regulated so that there is not quite enough air to give absolutely perfect combustion, to the end that there will be little or no free oxygen in the flame to oxidize the metal.

For the same reason the little furnace that must be built up and around the fracture to be welded should have just space enough for the flame to whirl around the frame, give off its heat to the fire bricks and fire clay, which soak it up like a sponge soaks up water, without this flame being driven too hard against the metal, as this will cause wasting away. The inlet for the flame and its first contact with the metal should be at the back or unimportant part of the frame and not against a finished surface, that has been or must be machined, as the wasting away is greatest at first impact of the flame. There should be as little space between the metal to be heated and the furnace wall as will suffice, as the heating is done principally by the heat that has been soaked up by the bricks and is radiated back against the metal. Radiation loses force rapidly with increasing distance.

The outlet for the waste flame should be located where the man doing the job can watch the heat through it and see the weld, as a minute's extra heating is very wasteful.

No more of the frame should be heated than must be to get a good weld, seldom over 4 or 5 in. each side of the break.

The furnace must be so built that a couple of quick blows of a sledge will knock it all down, clear out of the way, so that the smiths can sledge up the weld on the sides while yet at the serviceable heat. The pit can be partly full of water into which the red hot bricks fall.

A 4 by 5-in. frame can be brought to a welding heat in not to exceed 20 minutes, if the points just mentioned are observed.

When a weld is made in this manner the frame will, of course, be a trifle shorter and somewhat wasted away, which is objectionable. To avoid this it is best to jack the fractured part and place in the fracture $\frac{3}{8}$ in. of good high-grade soft-hammered iron. The irregularity of the fracture will usually keep the surface more or less apart, which has the advantage of allowing the heat to penetrate between the broken surfaces. The soft iron between the broken parts heats first and acts as a cement, welding more easily on the broken surfaces than they will to one another.

To get a perfect weld, a 30-ton hydraulic jack should be in place before the heat is started, so that when the metal is at welding heat it can be pumped up and force the broken surfaces together at its full power. To prevent the frame bending under this pressure it must be counterbraced, which is usually easy to do. By jacking the fracture together in welding the surface around the weld is bulged out a little all around, and after the furnace is knocked down while the pressure of the jack is still on, the two smiths can hammer away at the surfaces of the weld, leaving enough to chip or file down to a fair bearing for shoes or wedges, etc.

It is best to make some centerpunch marks in the frame well away from the weld on either side; have a tram made to fit these punch marks, allowing just a little for shrinkage for the final cooling off. These punch marks must be well outside of the furnace and the tram made to straddle it. Then the tram can be held to place where the jacking is done and the foreman can see when the weld has been sufficiently crushed together.

With skill many a broken frame can be welded in place in this manner and give satisfactory service afterward, but if the frame is too weak in design at the broken place it needs strengthening or it will break again. We cannot add metal by welding as described, but must resort to some other method.

The recently developed process of Thermit welding permits repairs to be made and reinforcement to be made on broken frames in cases that could not be handled in any other known way.

The Thermit process is not a welding process in any sense of the word, but is a casting process. The blacksmith has little or nothing to do with it; as a general proposition he should be kept out of it, as his prejudices and his interests must naturally be in an entirely different direction.

Perhaps a history of the writer's experiences in learning to use Thermit successfully will serve as a guide for others who have not tried it, or show those who have had ill success with it how they can reach success.

Profiting by the experience of a disappointed neighbor, we did not make any attempt to weld engine frames at first. The first thing done was to make a few small casts of Thermit; study its temperature and action on small sections of iron and steel. Following this we took some short broken sections of old frames and laid them in a mold on the foundry floor and attempted to mend the fractures by Thermit.

Following the usual prescription given us at that time by the manufacturers, the first cast was made and the result appeared to be a first-class job; however, bearing in mind the trouble our neighbors had had, the piece of metal was put in a planer and sliced from end to end, exposing the core or center of the weld. One-half of this was polished on the emery wheel on the guide grinder, and this

showed—while bright—that the molten steel from the Thermit had welded itself to the partly fused stub ends of the old frame, but in cooling off had shrunk by natural contraction, leaving a number of cavities, like blow-holes, in the center, which materially weakened the section at that point.

It was found that this metal was exceedingly hard and brittle, while the rest of the frame was of the usual soft-hammered wrought iron, consequently we had a hard, brittle, spongy knot in the middle of the bar of soft iron.

The other half of this sample was heated in the furnace and drawn out under the steam hammer. It drew down to about one-half of the original section and then broke in two, through the old fracture and through the center of the Thermit. The fracture showed that the break had occurred through these shrinkage cavities or blow-holes.

Study of the proposition indicated clearly that some method of forcing the broken fracture together, after the cast had been made, and during the process of cooling off, and while the metal was still at welding temperature, was necessary, to close up the spongy holes—in other words, the shrinkage must be followed up in order to get solid metal. Another advantage of this would be that instead of the particles of the molten steel cooling off in the form they assume in a steel casting—in other words, in a crystallized condition—that this crushing together would in a measure produce a similar result to a subsequent forging process, in that it would knead or squeeze the congealing metal and make it more ductile.

To prove the correctness of this reasoning, a fresh sample was prepped and fresh cast was made with it in precisely similar manner to the first cast, but after pouring the cast the two ends of the frame were forced together with jacks a distance of a little over one-eighth of an inch.

The result justified our belief. The cavities were very much fewer and much smaller, and crushed together, so that they represented flaws or lines rather than holes. It was evident that the crushing process had not been undertaken soon enough, or with sufficient pressure to properly weld up these shrinkage cavities. It was also noticeable on the fractures, after polishing, that there was rather a definite line of demarcation at the junction where the cast steel had burned on to the wrought iron, and in cutting it it was noticed that when the tool went through the soft iron and came against the hard Thermit there was a distinctly different resistance, indicating still a hard knot in the middle of the soft frame.

The other half of this section, after being sliced, was drawn out under the steam hammer at a higher temperature than the first cast, and drew down to less than one-third of the original section before fracture took place, and this again showed breakage through the shrinkage cracks or cavities.

It was evident that our processes were not right yet, and since Thermit steel by its own nature must necessarily be a more dense and harder metal than any wrought-iron or cast-steel frame could usually be, it becomes necessary to figure out some way in which the line of demarcation between the Thermit, which is manganese steel, and the wrought iron, forged or cast-steel frame could be obliterated and be made more gradual, otherwise cracks would be sure to finally come in these frames at the point where this sudden change of quality in the material existed.

After much thought we decided to drill the frames on both sides of the fractures, choosing the size of the drills used to suit the size of the section; thus, as it were, making a series of dovetails in the two ends of the fractured frame, into which the liquid Thermit could be poured and interlock even though the welding might not be perfect. It would also do away with the sharp distinction between the Thermit steel and the soft metal of the original frame.

A third sample was prepared along these lines, and in view of the necessity of forcing it together more than was previously done, the original fractures were separated by small pieces of soft iron about $\frac{3}{8}$ in. The cast was made, and as quickly after the heat and flame and burning slag would permit the sections were jacked together until they resumed the original length between previously located center marks, which meant that the Thermit metal had been compressed three-eighths of an inch after pouring.

This weld showed a very distinct advance over the others. The cuff around the weld was swelled out, due to the jacking process.

When this sample was examined it showed at the section that the junction between the Thermit steel and the original metal was less clearly defined; there were only a few small spots or specks which would indicate shrinkage cavities.

The other half of this section drew down to about one-fourth size without any fracture, except a few small ragged surface cracks at the corners, and we felt that we had succeeded in developing a process which we could rely on to give satisfactory results.

One thing which was noticeable at once in the last experiment, which we had not thought of before, was shown by the polished fracture: the Thermit had melted off the ends of the dovetails. The conclusion to be drawn from this was obvious, that with such an arrangement as high a temperature as we had been experimenting with, with pure Thermit, was not necessary, and if anything objec-

tionable, so that we added to the following test a proportion of boiler punchings in the Thermit, thus cheapening the process, and as the intense temperature of the melted Thermit was partly used in melting this additional quantity of steel punchings the result was the temperature of the molten metal was reduced; the character of the Thermit metal after cooling off was different, in that it had not been so suddenly chilled and was less brittle, which was an additional advantage gained by this new method.

We then proceeded to weld broken frames, following the lines of the last experiments, and have been, with two exceptions, universally successful.

To help toward certainty in the weld we arranged the Thermit mold around the fracture with an opening in the bottom for a gas or oil flame and, just as if we were going to make a flame weld in place, the frame and inside of the mold were heated until brought up to a bright cherry red, after which the hole in the bottom of the mold was quickly closed and made secure with a dry sand plug luted in and back with sand and the Thermit touched off.

By doing this the Thermit was not chilled by a mass of cold frame; it did not require to be robbed of so much of its heat to fuse the heavy frame ends and a larger proportion of punchings could be used successfully, thus greatly cheapening the work. This preheating of the mold is of great importance.

To reinforce a weak place the usual cuff that is cast around the weld can be extended or thickened, making the weak place stronger than before the break.

There are, of course, plenty of places about locomotive frames where fractures may occur where Thermit cannot be used, on account of the cuff interfering with attachments, but in many such cases we have chipped off such portion of the cuff as interfered and left the balance of it, in other cases the presence of the boiler mud-ring or other parts up against the frame prevented the use of Thermit. Of course, Thermit cannot be successfully used at the frame splices and in a few other places, and where it is just as easy to make an ordinary weld by means of a small furnace built around the frame as it is to use Thermit the ordinary weld is preferable and cheaper.

Rapid Transit in Chicago.

The following report was submitted by Mr. Bion J. Arnold to the Committee on Local Transportation of the Chicago City Council, July 2, 1906. Mr. Arnold, in his letter of transmittal, refers to the council's request that he discuss the traction situation as it exists at the present time, bearing in mind the changes in the legal situation between the companies and the municipality that have taken place since his 1902 report, and that he outline a general plan to follow. He points out that the principal objects to be accomplished at present, in addition to the changing of the river tunnels, are the through-routing of cars and the adoption of a universal transfer system. The accomplishment of these objects necessitates decisions upon the following points:

First—Type of construction (whether trolley or underground conduit system) to be adopted in the downtown business district.

Second—The disposition of the river tunnels, that is, whether they shall be abandoned or reconstructed at a lower depth to facilitate navigation, and utilized in the future as parts of a surface transportation system, or be so reconstructed that they will at once, or ultimately, become parts of a permanent subway system.

Third—Whether any subway shall now be built, and, if any, how much.

I.—Underground Conduit versus Overhead Construction.

In my report of 1902 one of the questions submitted to me was as to the feasibility and practicability of underground conduit construction for the city of Chicago. I reported that it was feasible both to construct and operate.

The running of electric cars, however, over certain streets or portions of streets by means of the overhead trolley and then changing to the underground conduit system necessarily means delay and annoyance at the point of transfer, and makes the use of the underground conduit system under such conditions more difficult than it would be could the cars operate throughout their entire course with the underground conduit system. To use the underground conduit system for the entire surface railways of Chicago would make the cost so much as to make the reconstruction of the present systems practically prohibitive, therefore, if any underground conduit system is adopted in the city at the present time it would be necessary to change from the overhead trolley to underground construction at certain points. As shown by my original report and by my specifications for the Adams street line, I have always insisted that these transfer points should be removed as far from the center of the city as possible, bearing in mind the largely increased cost of underground construction as compared with overhead. The principal object of having these transfer points removed from the center of the city is that the change may be made after the car has passed out of or before it has reached the zone of congested traffic. I have also recommended that this transfer should take place in a building or other locality that could be

equipped with apparatus especially adapted for prompt service. The subject, therefore, resolves itself largely into a question as to how much underground conduit the city is prepared to insist upon at the present time. If it is now proposed to insist upon only a limited amount of underground conduit construction, and that in the strictly central district, it is my opinion that the benefits from this will not be sufficient to justify the additional cost, considering the fact that the change from underground to overhead will be attended with annoyance which will substantially equal that which will arise from the use of the overhead trolley in the business district. There are other objections to the immediate construction of the underground system in the business district arising from the necessity of a certain amount of sewer reconstruction in that district, and the possible installation of a high-pressure water system. The subway question is also involved and is of great importance. The construction of a certain amount of subway for taking care of the cars which now pass through the river tunnels must be borne in mind as one of the strong probabilities if not reasonable certainties of the near future. To construct underground conduit on streets which are likely to be used for subways within any reasonable time would be obviously uneconomic as these conduits would have to be taken out in the event of a high-level subway being constructed in any street where conduit construction had previously been built. For instance, State street is now one of the streets, if not the principal street, upon which underground conduit is desired from the public point of view. In the plans which I have heretofore recommended for subway construction I have advised a high-level subway on State street. If there is any probability of the construction of such a subway in the early future it would be unwise to install an underground conduit on this street at the present time.

Owing to the fact that the plan of financing the street railway reconstruction has radically changed since my original report, and that it is now proposed to reserve to the city, or its licensee, the right to purchase the entire railway system for the value of the present property and the additional investment for improvements, it would appear to me wise to omit the construction of any underground conduit at the present time, but to specifically reserve, in any ordinances or permits that may be granted, the right that the city may require the construction of underground conduit as soon as the subway and sewer questions have been disposed of and the city has then determined upon a sufficient amount of conduit construction to carry the transfer points well out of the business center.

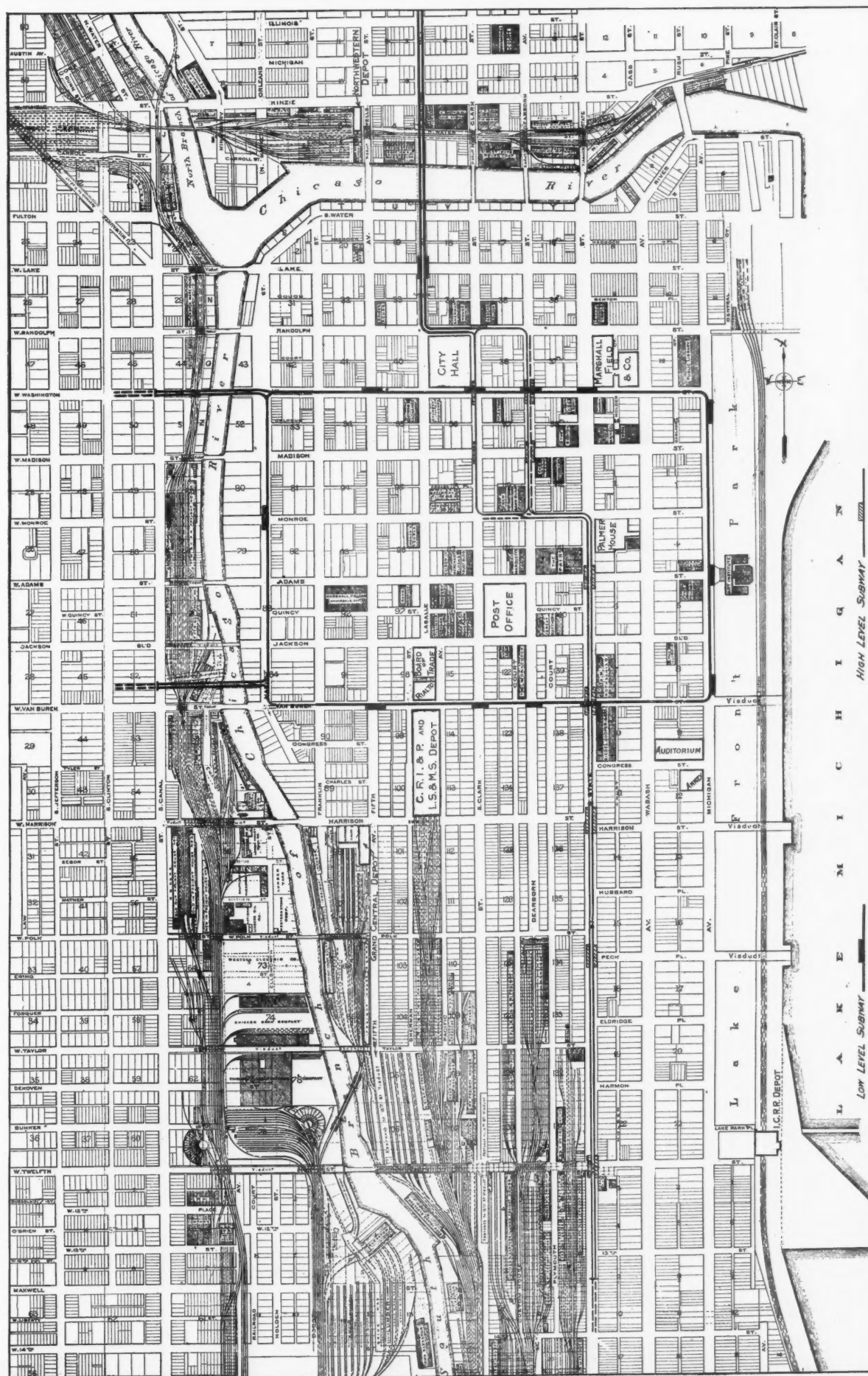
When it has become sufficiently clear that the city should and can provide for the construction of underground conduit in any one street, such as State street, for a sufficient distance to enable the cars to be operated solely by underground conduit throughout their entire course, or at least until they have reached the point where the traffic has clearly ceased to be congested I should recommend the adoption of the underground conduit, and not until then.

All feeder and transmission wires, however, should be placed underground within a district at least as large as that prescribed by the ordinances recommended by your committee on December 4, 1905.

II.—Subways.

With regard to subway construction, it is my opinion that all cars which pass through the tunnels under the Chicago river should be kept underground and off the surface of the streets in the downtown business district. It seems sufficiently clear that in any future development of the transportation system in this city we shall have to use some tunnels under the Chicago river between the business district and the north side and west side in order to give the citizens of these divisions the same reliability of access to the business center that the citizens of the south side now enjoy. As it will be, in my judgment, impracticable to permanently take care of the traffic by the use of bridges alone, owing to the interference from navigation on the river, and from the fact that we must at once modify the river tunnels, I can see no reason why a beginning should not be made at once in the direction of the development of a subway system. I understand that it is now contemplated to lower the existing tunnels as soon as a permanent solution of the traction question can be reached, either with the present companies or otherwise. That being so we should provide for taking care of the traffic through these tunnels by the necessary amount of subway in the central part of the city, and so plan that this subway shall be available as part of the complete system in the future. Any subway which is now constructed should be available for any reasonable development of subway construction at any time hereafter.

Your committee is already familiar with my recommendations as to subway construction, as given in my report of 1902, wherein I submitted two different subway systems, viz.: Subway Plan No. 1, as shown upon Map No. 11, and Subway Plan No. 2, shown upon Map No. 5. Plan No. 1 was submitted as an alternative plan in case Plan No. 2 could not be built. Plan No. 2 contemplated the construction of some low-level subways which would conflict with the large bore tunnels of the Illinois Telephone & Telegraph Com-



Chicago Subway System as Suggested by Bion J. Arnold.

pany (now the Illinois Tunnel Company), which that company at the time of the 1902 report was endeavoring to secure the right to build. Since the publication of that report the tunnel company has abandoned the plan of constructing these large bore tunnels, and is bound by the terms of its ordinance to keep its tunnels a certain distance below city datum which places them a sufficient depth below the surfaces of the streets to allow the construction of the low-level street-car subways. Thus the principal objection to Subway Plan No. 2 is removed, and I again recommend this plan, in general, as the best solution of the subway question for the reasons given in my report of 1902. Briefly these are as follows:

First—Grade crossings in subway construction are avoided.

Second—This subway system ultimately provides for a comprehensive downtown distributing system, and permits the universal use of transfers without injustice to any one, so that all of the objections to the exchange of transfers in the center of the city, which have been urged with such force by the railway companies in connection with the surface system, will disappear if such transfers take place only in the subways.

Third—The construction of portions of this subway system would permit the immediate adoption of through routes in subways between the north and south sides, and loops in subways for the north and west and south side systems.

I appreciate fully the necessity of confining any subway construction in the immediate future to the smallest possible amount that will take care of the traffic which is intended to pass through the river tunnels when lowered and reconstructed. This traffic can be accommodated and kept off the surface of the streets in the downtown district, and the advantages of the transfer system secured up to the capacity of the subway herein recommended for immediate construction, by a low-level single-track subway loop passing through the Van Buren street tunnel, south on Market street to Van Buren street; thence proceeding eastward in Van Buren street to Michigan avenue; thence north in Michigan avenue to Washington street; thence west in Washington street through the Washington street tunnel. This single loop tunnel to be connected on Market street by a single-track low-level tunnel between Washington and Van Buren streets. The complete loop thus constructed would take care of the west side traffic passing through the river tunnels until such time as it became necessary to construct a third river tunnel in Adams street and additional loops as shown in the completed Subway Plan No. 2.

By retaining the present eastern outlet to the Van Buren street tunnel, which could easily be done since it is on private property and does not interfere with the surface of any street, the subway loop cars could be brought to the surface and distributed over surface loops at any time when, through accident or otherwise, congestion occurred on the west side subway loop.

To take care of the north side traffic which would pass through the reconstructed La Salle street tunnel there should be a low-level double-track subway extending from the La Salle street tunnel south on La Salle street, gradually rising to Randolph street, where it becomes a high-level subway; thence east on Randolph street to Clark street, where the tracks would divide, one extending eastward on Randolph street through a single-track high-level subway to Dearborn street. The other track would swing south on Clark street through a single high-level subway and extend south on Clark street to Monroe street. A double track high-level subway should extend on Dearborn street from Randolph street to Monroe street, and on Monroe street from Clark street to State street, thence southward on State street to Fourteenth street, or whatever point your committee may determine upon as the present temporary southern entrance to this subway. A single track only would be laid, at present, in Monroe street from Clark street to Dearborn street, and in Dearborn street from Monroe street to Randolph street, and a double track in Monroe street from Dearborn street to State street. This arrangement (as shown on the map accompanying this report), will permit a double-track subway route between the north and south sides of the city, as well as provide for subway loops for all traffic coming through the river tunnels from the north and west sides.

If it is desired to provide for through-routing of cars through subways from the west side to the north side, and from the west side to the south side this can be taken care of by the construction of a double-track low-level subway on Randolph street, beginning at La Salle street, where it would connect with the La Salle street tunnel subway, thence west to Market street, thence south on Market street to Washington street, but I do not consider the construction of this piece of subway necessary at the present time, as it is not required in the permanent subway system, and if put in would introduce grade crossings in the subway which I have carefully eliminated in the completed system recommended, and would be built solely for the purpose of through-routing from the west division to the north and south divisions, which routing can be effectually accomplished with the surface systems.

Should your committee think it best not to do any subway construction on Clark, Dearborn or Monroe streets at the present

time most of the above mentioned objects can be accomplished, though not so satisfactorily, and with some less expense, by continuing the double-track subway north on State street from Monroe street to Randolph street, thence west on Randolph street to Clark street.

To construct the low-level subway loop and north and south subways, as above described and recommended will cost approximately.....	\$4,800,000
If the double-track connection on Randolph and Market streets, for the purpose of through-routing is desired, it will cost an additional.....	40,000
If no subways are built on Clark, Monroe and Dearborn streets, and the double-track subway is extended on State, Randolph and Market streets, the cost would be approximately.....	4,500,000

The above figures do not include the cost of changing the river tunnels, or damages to property.

III.—Summary.

Summarized, then, my recommendations as to what to do at present are as follows:

First—Trolleyize the cable systems and the terminals in the business district to such an extent that the through-routes recommended in Exhibit C, and shown on Maps 18 and 19 in Supplement No. 2 of my Report No. 3, dated November 16, 1905, and adopted by you November 27, 1905, can be put into effect, with the understanding that when the completed subway system is built that the tracks in the business district will be modified to conform to the arrangement shown on Map No. 17 of that report. All feeder and transmission wires to be placed underground within the business district and such other territory as your committee may determine.

Second—Take immediate steps for rehabilitating the present surface systems, and for constructing the subways herein outlined.

Third—Reconstruct the river tunnels, when they are reconstructed, at such level and in such a manner that they can be used as part of a permanent and comprehensive subway system.

Respectfully submitted,

(Signed) BION J. ARNOLD,
Consulting Electrical Engineer.

I concur in the recommendations as to general policy outlined in the above report.

(Signed) WALTER L. FISHER,
Special Traction Counsel.

Hill's Canadian Invasion as Seen by Eastern Canada.

BY J. A. MACDONALD, C.E.

Mr. J. J. Hill's invasion of Canada is now an assured fact. Western Canada, from Manitoba to the coast, hails his advent with the greatest enthusiasm. The West wants all the railroad competition possible, and cares not whence it comes. It knows what it is to suffer grinding monopoly. What further accentuates Mr. Hill's welcome in the West is the large number of his old neighbors from Dakota, Montana and Minnesota, who are now settled and settling there. But if the West hails the invasion of Mr. Hill with such evident delight, Old Canada does not nor do the Canadian railroads. Their cry is, "Canada for the Canadians."

Had Canada and the United States been under one flag since 1776, it is safe to say the main lines of Canadian railroads would have been built from north to south rather than from east to west. Starting at British Columbia, we should have had roads running, not diagonally across the mountains, but down the valleys into Washington, Oregon, California, Idaho and Montana. The wheat of the Northwest would have been carried to Minneapolis and Duluth and the north shore of Lake Superior given a wide berth. It would not have been necessary to bring the Intercolonial to Levis or Montreal. Montreal and Quebec would have been the summer ports, but in winter the provinces of Quebec and Ontario would have used Portland, Boston and New York, nearer to them than St. John or Halifax. This would in all probability have been the state of things now existing had we been American subjects. As we are not American but British subjects, ambitious to build up a British nation on this continent, our policy has hitherto been to confine Canadian traffic as far as possible within Canadian channels, just as, since 1879, we have endeavored to do our own manufacturing. There was no other way by which we could hope to solidify the country.

The Intercolonial, which has cost \$80,000,000, was the first railroad built from east to west to serve this great political object. The Grand Trunk united Upper and Lower Canada, but in a commercial rather than a political sense. Then came the Canadian Pacific, built primarily to connect the Northwest and British Columbia with Old Canada. Though its eastern division traverses Maine, it does so in the interests of St. John and Halifax. As a Canadian line, it was obliged to build along the north shore of Lake Superior, a more or less hopeless wilderness 600 miles wide, and to face the enormously expensive work involved in crossing at right angles the mountain ranges of British Columbia. The Canadian

Northern, a commercial and, as yet, local railroad, has been built from east to west within Canadian territory in order that its traffic may be handled by Canadian lake and ocean ports. The Grand Trunk Pacific is to run in the same direction and on Canadian soil all the way from Moncton to the Pacific, for the same purpose. The cost of these four roads, counting public and private expenditure, will approach \$500,000,000.

With the same determination to make herself independent of the United States, Canada has built canals between Montreal and the Soo at a cost of \$100,000,000. There were some who argued that, instead of going to so much expense, she should use the Erie, Oswego and Champlain canals to reach New York with her products, but they were promptly overruled. In addition Canada has spent many millions of public and private capital in dredging channels, improving harbors and building elevators, docks and ocean steamships in the belief that Canadian traffic, including that of the West, would be preserved for Canadian ports. When Mr. Blake and Sir David MacPherson suggested that the Canadian Pacific should commence opposite Pembina, N. Dak., on the United States boundary south of Winnipeg, and going up to Winnipeg and Selkirk, cross the prairies and mountains to the Pacific ocean, its eastbound freight being turned over to the American lines at Pembina, they found few sympathizers. Liberals as well as Conservatives in Old Canada asked, "Why should we tax ourselves for so great an enterprise if the Americans are to be the principal beneficiaries—if Montreal and Quebec, Halifax and St. John are to be cut out of the export and import traffic?"

Canada's policy in these vital matters is apparently about to be reversed. Some time ago, with Mr. J. P. Morgan's assistance, Mr. Hill consolidated the Northern Pacific with his own road, the Great Northern. They are still separate corporations in name but are both under his immediate control. At present he taps Canadian territory between the Red river and New Westminster at a dozen different points, nine or ten other branches run to within a few miles of the boundary, and he is building a main line through British Columbia, which is to be extended eastward, he says, to Winnipeg. All these roads are or will be feeders of the Northern Pacific and Great Northern, and all the Canadian traffic they bring down will be carried to American ports. When Mr. Hill has fully executed his plans, the Northwest and British Columbia will be much more closely attached to the United States than to Old Canada, so far as railroad communication is concerned.

Mr. Hill is a veteran campaigner. He knows how to appeal to human nature. His promise to spend \$30,000,000 on his road from Fernie to Winnipeg, \$25,000,000 on the Vancouver, Victoria & Eastern, and an indefinite sum on his new spurs in Manitoba, has, of course, aroused much enthusiasm in Manitoba and British Columbia. His announcement that Canadian hard wheat is about to be admitted free into the United States is another happy stroke of the same kind. If Mr. Hill is to be believed, one purpose of his in thus entering Canadian territory is to feed the Canadian Pacific and Grand Trunk Pacific. However, by carrying their traffic for shipment to American lake and ocean ports, he will seriously impoverish the Canadian roads, besides doing great damage to Fort William, Midland, Depot Harbor, Owen Sound, Montreal, Quebec, St. John and Halifax.

Taking the Northern Pacific and Great Northern together Mr. Hill now has lines reaching the Canadian boundary, or to within a short distance of it, at the following points:

- (1.) From the Great Northern main line to Greenbush, near Warroad, on the Canadian Northern, at the south end of Lake of the Woods.
- (2.) From the Northern Pacific to Pembina; two spurs from the Great Northern to Emerson and Gretna, further west.
- (3.) From the Great Northern to Wallhalla, Hannah, Hansboro, Thorne, Sables, St. John, Bottineau and Sherwood, all separate spurs.
- (4.) From the Great Northern to the boundary of Sweet Grass (Coutts) and thence to Lethbridge.
- (5.) From the Great Northern, separate spurs to Fernie, Kootenay Landing by way of Creston, Nelson, Kaslo and Sandon, Rossland, Grand Forks and Midland.
- (6.) A Northern Pacific line from Mission Junction, B. C., to Seattle and Portland; together with a Great Northern line from New Westminster and Vancouver to the terminus of the main line at Seattle.

In other words, Mr. Hill has already tapped Canadian territory at 12 or 13 different points and is within striking distance of the boundary at nine more.

His entrance into Canada is of vital moment not only to the Canadian transcontinental railroads but to Canadian lake and ocean ports as well. Canada has sunk a vast amount of public money in all three, and private capital has sunk more. Canadian ocean ports, Montreal and Quebec, St. John and Halifax, have been handicapped in various ways from the beginning.

(1.) The navigation laws, whereby none but British bottoms were allowed to participate in the colonial trade, were the cause of excessively high outward ocean rates from Quebec down to their repeal 60 years ago, with the result that a great deal of the produce

of upper Canada destined for Europe was sent by way of the Erie canal to New York.

(2.) Nature is somewhat unkind. For five months of the year the St. Lawrence is icebound and business has to be transferred to St. John and Halifax. Such a break in the continuity of trade is, of course, a very serious matter for Montreal and Quebec.

(3.) Halifax and St. John are excellent winter ports, but geography is against them, since the Ontario exporter and importer finds it cheaper to use Portland, Boston and New York, which are considerably nearer.

(4.) Marine insurance favors American and discriminates against Canadian ports, more especially in the fall, when export grain is going out.

(5.) The Welland and St. Lawrence canals, on which \$100,000,000 has been spent, are not deep enough to accommodate the modern type of steam vessel employed on the upper lakes, the result being that a considerable percentage of wheat grown in the Canadian Northwest, and the great bulk of that grown in the northwestern states, reaches the Atlantic by way of Buffalo and New York or by other American routes and is lost to Montreal.

(6.) Ocean traffic at Montreal is crippled to some extent by inadequate harbor accommodation as well as by the danger involved in taking the larger vessels up the St. Lawrence. This will be improved with the deepening and widening of the channel; meanwhile the port of Montreal is suffering from those drawbacks and must for some time yet continue to suffer.

(7.) Great sums are and have been spent by the United States Government in improving the harbors of New York, Boston, Portland, Baltimore, Newport News, Philadelphia, etc. As the efficiency of those seaports increases, they become more and more formidable competitors of Canadian summer and winter ports.

In giving Mr. J. J. Hill the free run of the Northwest and British Columbia, thereby enabling him to carry their traffic south, Canadian ports will be dealt a hard blow. When the Government chartered the Grand Trunk Pacific it did what it could to prevent the diversion of traffic to Portland. But what will that avail if traffic is to be switched south to the American seaboard at the points of origin? The question is one of momentous importance to eastern Canada and its ports. They believe they have a better right to handle Canadian traffic than Mr. Hill's railroads; than Duluth and Buffalo, New York and Boston. In taking this ground eastern Canada cannot be accused by Americans of narrowness of spirit. It's wish is simply to retain Canadian business in Canadian channels, on which a vast amount of money, public and private, has been spent; just as Americans keep their home market to themselves by means of a high tariff wall, and their coasting trade to themselves by prohibiting Canadian vessels from trafficking between one American port and another.

Comparative Test of Large Locomotive Air Pumps.

In the course of the development of the present-day railroad practice it has come about that the demand for compressed air by the air-brake and the auxiliary apparatus, such as bell-ringers, sanders, water scoops and the pressures used on Pullman cars, has become far in excess of the capacity for which the air pump was originally designed. In response to the demand for an increased air supply the New York Air-Brake Co. brought out a duplex pump; this has been more recently followed by the Westinghouse Air-Brake Co., with a compound pump illustrated in the *Railroad Gazette* of June 30, 1905. These pumps have been designed to take the place of the 11-in. Westinghouse pump that was thought at the time it was brought out to have a capacity sufficient to supply air for all conditions of train service.

As the locomotive air pump in its original form was not an economical machine from the standpoint of steam economy, and as the great demands made upon it of late have resulted in a serious drain upon the coal pile, an attempt was made in each of the pumps referred to to secure a better steam distribution and consequently to do more work per pound consumed. With a view of determining in a practical way the capabilities of the two types of compressors, the officials of the mechanical department of the Lake Shore & Michigan Southern have recently completed a series of comparative tests between the New York No. 5 duplex pump and the Westinghouse compound.

The tests were divided into three classes as follows:

- 1st. Efficiency and capacity tests with pumps working against constant pressure.
- 2d. Efficiency and capacity tests with the pumps working against increasing pressure as in charging reservoirs.
- 3d. Efficiency and capacity tests with the pumps working against an approximately constant pressure, an orifice in a diaphragm being used to approximate the amount of air delivered.

The steam was furnished by a locomotive boiler and was first passed through a jacketed receiver that served not only as a separator but a means of controlling the pressure. The exhaust steam from the pumps was condensed in a surface condenser and then

weighed. The delivery pipes of the pumps were connected to the constant pressure reservoir No. 3, the overflow from it being alternately measured in the measuring reservoirs Nos. 1 and 2. In arranging the pumps and reservoirs, an effort was made to have the pipe volume of each pump the same. The difference was slight, the Westinghouse pump having the larger volume. Thermometers were inserted in the delivery pipes near the discharge valves of the two pumps, and in reservoir No. 3. Pressure gages were attached to reservoirs Nos. 1, 2 and 3, and to the steam receiver. The strokes of the pumps were taken with an ordinary reciprocating counter. The whole apparatus was arranged so that the conditions were almost identical for both pumps, thus avoiding the necessity of making corrections for observations.

In the first series of tests the pumps were worked with steam pressures of 150 lbs., 175 lbs. and 200 lbs. per sq. in., and the pressures against which they worked varied from 70 lbs. to 130 lbs. With 200 lbs. steam pressure the constant air pressures against which the pumps worked were 70 lbs., 100 lbs., 130 lbs. and 140 lbs., with the following results: The total amount of free air pumped by each pump was the same, but the work was done in a shorter interval of time by the Westinghouse than it was by the Duplex; while there was a marked decrease in the quantity of steam used,

was 30 lbs. in every instance, and the work was done under nearly identical atmospheric temperatures, though in some cases that obtaining at the time of the Duplex pump tests was 3 deg. the higher. The results are given in the following tables for the several steam pressures used.

Comparison of Time and Steam Required to Compress 100 cu. ft. of Free Air from Initial to Final Pressure.

		Steam Pressure, 200 Lbs.				Steam Pressure, 175 Lbs.				Steam Pressure, 150 Lbs.			
		Westinghouse				Westinghouse				Westinghouse			
		70.0	100.0	130.0	140.0	70.0	100.0	130.0	140.0	70.0	100.0	130.0	140.0
Final air pressure, lbs.	...	40.2	41.8	43.5	43.8	42.3	44.3	46.9	49.2	43.7	47.6	52.7	55.0
Time req. to compress, sec.	...	21.2	20.9	20.9	21.1	23.0	23.1	23.2	23.1	23.0	23.1	23.2	23.6
Steam used, lbs.	...	18.7	18.5	18.5	18.5	23.0	23.1	23.2	23.1	23.0	23.1	23.2	23.6

Taking the percentages of the gains thus shown by the Westinghouse compound pump we have:

		Table of Gain in Time, Per Sec.				Table of Saving of Steam, Per Cent.			
		Steam pressure				Steam pressure			
		200.	175.	150.		200.	175.	150.	
Final pressure.	...	25.6	140	78.0
140	...	21.1	31.1	33.4	130	78.0	111.2	93.9	...
130	...	13.9	21.4	24.0	100	58.1	75.1	79.0	...
100	...	8.6	16.4	19.7	70	51.4	23.1	93.5	...

In the last series with the pumps working against an approximately constant pressure and discharging through an orifice in a diaphragm the results showed an average saving of steam of nearly 38 per cent.

As already stated, there was a slight difference of reservoir capacity for the two pumps, due to a variation in the piping and in calculating the units of comparison, time and steam per 100 cu. ft. of free air, this reservoir difference was considered but was too small to be noticed. It will be observed that the initial pressure in these tests was 30 lbs. in each case, increasing to 70 lbs., 100 lbs., 130 lbs. and 140 lbs., this minimum pressure being selected owing to the excessive pounding of the heads of the New York Duplex, a condition which largely prevailed when the pump was working against low air pressures.

In this connection it may be said that the Westinghouse Compound worked very quietly, regardless of either high or low air or steam pressures, the tendency to pound being absent even when the

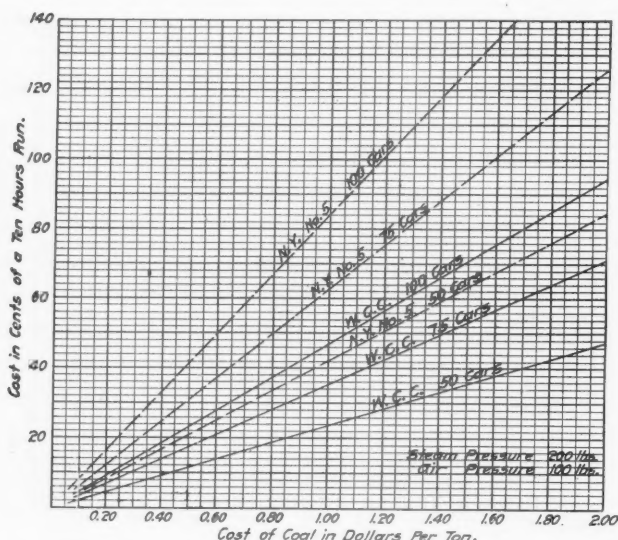


Diagram Showing Cost of Coal for Operating Air Brakes.

and this was coupled with lower initial and final temperatures. The first items are shown in detail in the following tables:

Comparison with Steam Pressure at 200 Lbs.

		Westinghouse				Duplex			
		140.0	130.0	100.0	70.0	140.0	130.0	100.0	70.0
Free air per min., cu. ft.	...	115.5	131.0	151.6	168.0	75.2	93.6	115.7	138.2
Weight of steam used, lbs.	...	143.5	121.3	116.0	94.8	317.6	249.0	207.8	164.5

This gives the percentage in favor of the compound pump.

		Constant air pressure			
		140.	130.	100.	70.
Free air delivered, lbs.	...	53.6	40.1	31.0	21.6
Free steam used	...	121.3	105.4	79.1	74.0

Comparison with Steam Pressure at 175 Lbs.

		Westinghouse				Duplex			
		130.0	100.0	70.0		130.0	100.0	70.0	
Constant air pressure, lbs.	...	107.9	132.4	151.6		72.3	100.3	122.4	
Weight of steam used, lbs.	...	124.5	110.8	85.8		251.0	206.3	155.5	

The percentage in favor of the compound pump is:

		Constant air pressure			
		130.	100.	70.	
Free air delivered, lbs.	...	49.2	32.1	23.5	
Weight of steam used, lbs.	...	101.6	86.2	81.4	

Comparison with Steam Pressure at 150 Lbs.

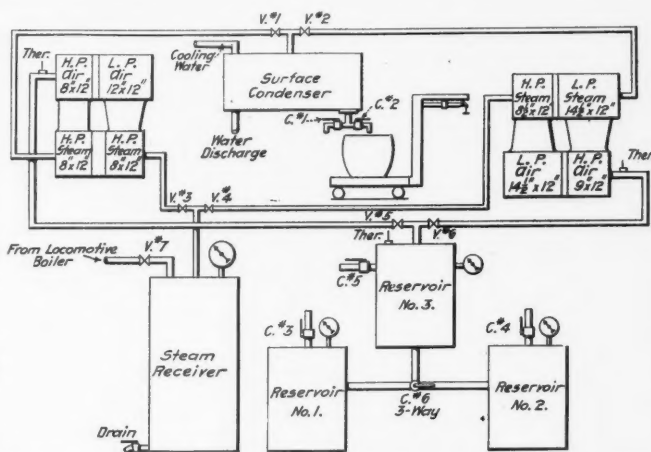
		Westinghouse				Duplex			
		120.0	100.0	70.0		120.0	100.0	70.0	
Constant air pressure, lbs.	...	85.8	110.9	132.5		60.0	79.6	106.1	
Weight of steam used, lbs.	...	105.5	102.8	81.5		220.8	208.5	148.5	

The percentage in favor of the compound pump is:

		Constant air pressure			
		120.	100.	70.	
Free air delivered, lbs.	...	43.0	39.3	24.9	
Weight of steam used, lbs.	...	109.3	102.9	82.2	

From this it appears that the compound pump was not only by far the most economical in the use of steam but had the greater capacity of the two by from 21.6 to 53.6 per cent., according to the conditions under which the pumps were worked.

In the second series where the test was for capacity with the pumps working against an increasing pressure, the time and weight of steam consumed in the work was taken. The initial air pressure



General Arrangement of Apparatus Used for Comparative Test of Westinghouse and New York Locomotive Air Pumps.

throttle was thrown wide open with a high boiler pressure and with little or no air pressure in the charging reservoirs. This is of special importance owing to the "racing" of pumps against low pressure being responsible for a large portion of the failures of pumps of the simple and duplex types.

Aside from the important question of being able to supply the air needed for all the various auxiliaries upon a modern train, that of cost of coal for the operation of the pumps must be considered. In order to show this relation as derived from this series of tests the accompanying diagram has been drawn up in which the cost of coal for operating the air-brakes on trains of different lengths is shown for the two types of pumps under consideration. In this the effect of the percentage of saving is brought out very clearly where it appears that the cost of operating a 75-car train with the Westinghouse compound pump is about 17 per cent. less than that of operating a 50-car train with the New York Duplex pump, or a comparison of 50-car trains shows a saving in coal of about 45 per cent.

GENERAL NEWS SECTION

NOTES.

The business men of Selma, Ala., have established the Selma Rate Bureau, and it is in charge of J. T. Slatter.

The Northern Express Company has been incorporated as successor to the Northern Pacific Express Company. This is believed to be a step in the merger with the Great Northern Express.

The United States floating drydock "Dewey" which left Chesapeake Bay on Dec. 28, 1905, in tow of two colliers, arrived at destination, Olongapo, P. I., on July 9, after a voyage of 12,000 miles. The trip was made via the Suez Canal.

The Attorney-General of Virginia has begun proceedings to compel the railroads to comply with the Churchman act, which is the law passed at the last Legislature requiring all railroads to sell mileage tickets at 2 cents a mile.

The Canadian Pacific now has two copper telegraph wires between Montreal and Winnipeg and has a number of offices equipped with telegraph apparatus, by which both telephones and telegraph instruments are used on these wires.

The President of the Pennsylvania Railroad has issued an order directing all officers and employees to divest themselves of any interests, direct or indirect, that they may have in coal companies, or other shippers or interests connected with the business of the road, as recommended in the report of a special committee of the directors, which was given in the *Railroad Gazette* last week.

The Pennsylvania Railroad has issued elaborate and carefully revised rules for the movement of coal cars, both loaded and empty, and the distribution of cars to shippers, with a view to providing a perfect record for reference in case of dispute as to whether or not injustice has been done to any shipper.

The Secretary of Agriculture has notified the railroads that he intends to strictly enforce the live stock transportation law, as amended by Congress at the last session. Animals may now be kept in cars 36 hours on the written request of the owner, or person in custody of the shipment; and the time for confinement of sheep in cars may be extended from 28 hours to 36 rather than unload them in the night time.

At Chicago, July 7, a jury in the Federal court returned a verdict of guilty against J. N. Faithorn and F. A. Wann, former officers of the Chicago & Alton, for granting illegal rebates to the Schwarzschild & Sulzberger Company. Sentence was suspended until July 11, at the request of the counsel for the railroad, for the purpose of securing new evidence, but none was produced, and fines were assessed aggregating \$50,000; on the railroad \$20,000 each on two counts, and on Messrs. Faithorn and Wann \$5,000 each on two counts.

The Atlantic City Railroad (Reading System) now runs a train from Camden to Atlantic City once each hour throughout the day, beginning at 5 a.m. and ending at 9 p.m. From Atlantic City to Camden there is a train every hour from 7 a.m. until 10 p.m. Besides these, there are four other fast trains to the seashore in the afternoon and three from the shore in the morning.

Judge Holt, in the United States Circuit Court at New York City, has sustained the demurrer of Messrs. Guilford and Pomeroy, of the New York Central, and Messrs. Edgar and Earle, shippers, to the indictment returned some time ago charging them with conspiracy to violate the laws of the United States. The men named were indicted for making secret and illegal rates on sugar from New York to Detroit, and suit was brought under Section 5,440, which prescribes either fine or imprisonment or both. Judge Holt holds that Congress, in passing the Elkins law of 1903, expressed the intention that violations of the freight rate law should be punished by fines only; the act expressly declared that imprisonment was abolished. The amendment passed this year, restoring the imprisonment penalty, is not retroactive.

Ties from Japan.

It is reported from San Francisco that the Harriman interests have made contracts in Japan for 1,500,000 ties, to be delivered at Guaymas, on the Pacific coast of Mexico, for 56 cents gold, each. One cargo of 83,000 ties has already been delivered. They are to be used on the 700 miles of new lines which are being built in the states of Sonora and Sinaloa in the interest of the Southern Pacific Company.

Increase in Gross Earnings.

Reports from 56 railroads show for the eleven months ended May 31 an increase in gross earnings of 12.3 per cent., compared with the same period of last year, and 15.4 per cent. increase in net earnings. Applying these percentages to the Interstate Commerce Commission's figures for 1905, the following results are obtained as an estimate of the earnings for all the roads of the country for the full year:

Total gross, 1905	\$2,073,177,000
Increase, 1906	255,000,000
Gross, 1906	\$2,328,177,000
Total net, 1905	689,593,000
Increase, 1906	106,197,000
Net, 1906	\$795,790,000

The following is a list of the estimated gross earnings for the year of the larger roads whose increase is over 10 per cent.:

Road.	Gross, 1906.	Increase.	Per cent.
Pennsylvania	\$134,000,000	\$18,000,000	15
Canadian Pacific	61,600,000	11,100,000	22
Northern Pacific	62,000,000	10,400,000	20
Atchafalpa	78,300,000	10,000,000	14
Baltimore & Ohio	77,219,000	9,600,000	14
Great Northern	52,000,000	8,500,000	19
Union Pacific	66,900,000	8,200,000	15
New York Central	89,400,000	7,100,000	10
Chicago & North-Western	62,700,000	7,000,000	13
Rock Island	51,000,000	7,000,000	16
Erie	49,600,000	6,300,000	14
St. Paul	55,000,000	5,000,000	10
Lake Shore	41,000,000	4,900,000	13
Louisville & Nashville	42,500,000	4,000,000	10
Norfolk & Western	28,200,000	4,200,000	17

—Wall Street Journal.

Report from Lodge No. 683.

MINOT, N. DAK., June 1.—On the evening of April 18th Grand Master John J. Hannahan and bride arrived on No. 5 from St. Paul on their wedding tour to the coast in J. J. Hill's private car. As we did not hear of this news until two hours before train time we were unable to give the Grand Master and bride the ovation that we should have liked to. On his arrival in the city he extended a cordial invitation to all brothers to meet with him in his private car, which was appreciated and enjoyed by all. By special invitation Master C. D. Riffey and wife and Secretary C. Amsbaugh and wife accompanied the bridal party as far as Williston. The Brotherhood appreciates very much the courtesies so generously extended to our Grand Master by General Superintendent Slade. Such acts as these tend to bind more firmly together the two great classes, Capital and Labor, and will aid in the solution of many of the industrial problems which are bound to arise.—*Locomotive Firemen's Magazine*.

A Juggernaut in Pennsylvania.

According to a press despatch from Altoona, Pa., of July 4, 11 men were killed near that city on the night of the 3d by a runaway freight car. It appears that on the Martinsburg branch of the Pennsylvania Railroad, a line on which trains are not run at night, a car was started from Portage by some unknown person and ran uncontrolled at high speed about three miles down the steep grade to Puritan, and in its course ran over and killed 11 men. Not more than two of the bodies were found in any one spot. On the following day it was reported that the victims of the runaway car were non-union miners and that the car had probably been maliciously started by enemies of these men, who were known to use the track as a footpath at night.

Government Purchase of Italian Railroads.

The Italian parliament has approved the purchase by the government of the railroads in southern Italy. Payment is to be made at the rate of \$6,000,000 annually for 60 years. The government already owns most of the important railroads of Italy.

New York Telephones.

A bulletin has just been issued by the New York Telephone Company and the New York & New Jersey Telephone Company showing the increase in telephones in New York City during the month of June just past. The total net gain in telephones for the month is given as 3,591. This is against a gain of 2,217 telephones during June, 1905, an increase for June, 1906, over the same month of last year of 62 per cent.

The Glory of St. Paul.

One of the most striking illustrations of the rapid development of the railroads of the Northwest is that to be seen any night by a visit to the Union Depot, at St. Paul, Minn., where, standing side by side, may be found four of the finest trains in the world, each run by a separate railroad, each bound for the same destination and

all scheduled to be started at nearly the same time. At no other place in the United States [or the world] can such a sight be seen, and to the railroad man it is really inspiring. The cars of these trains are all of the latest design and embody all the best features; and they are hauled by the fastest and most powerful passenger locomotives.

St. Paul is a night's ride, 410 miles, northwest of Chicago, and the traffic between the two cities is now heavy. The competition, however, is still heavier, for no less than six roads run through trains between the two points. Compared to the east, taking Pittsburg and New York, or Buffalo and New York, for example, the superiority of the western service is clearly apparent. Buffalo and New York are connected by the New York Central, the Lehigh Valley, the Lackawanna and the Erie, but the competition is not keen owing to the varied distances traversed by the several roads. Pittsburg traffic to and from New York is practically monopolized by the Pennsylvania. In the west conditions are different, and even with the high class service there is never any mention of extra fare. Competition forbids the thought of it. A glance at the folders published by the various companies shows the following St. Paul-Chicago mileage: Burlington, 431; Chicago Great Western, 420; Chicago, Milwaukee & St. Paul, 410; Chicago & North-Western, 410; Chicago, Rock Island & Pacific, 465; Wisconsin Central, 514. The last two named, owing to their greater length, do not strenuously compete but nevertheless run several good trains. The first four, however, are after the traffic all the time. The Burlington's famous No. 48, advertised as the finest train in the world; the Great Western Limited; the Pioneer Limited (St. Paul), and the new Northwestern Limited are the trains that attract the public, and they present a brilliant spectacle as they stand side by side with their innumerable sparkling electric lights glittering from one end to the other.

The Great Western Limited is the first to leave, at 8.30 p.m. It is closely followed (8.35) by the Pioneer Limited and the Northwestern's flyer goes at the same time. Five minutes after that the Burlington starts and the last of the quartette is off on its all night run to Chicago. The first and third reach the western metropolis at 8.55 a.m., while the Pioneer and Burlington are scheduled to reach the same depot at 9 a.m. The stops are such that all these trains have to maintain fast time, but the last named is compelled to make the fastest owing to the additional 21 miles in its route. The number of cars hauled varies according to the time of year but usually they range between seven and 12. All the cars are mounted on six-wheel trucks. The North-Western uses the Pacific type locomotive with piston valves; the Great Western the Prairie, while the Burlington and the St. Paul have the Atlantic type.

C. F. T.

Prize Story of the Season.

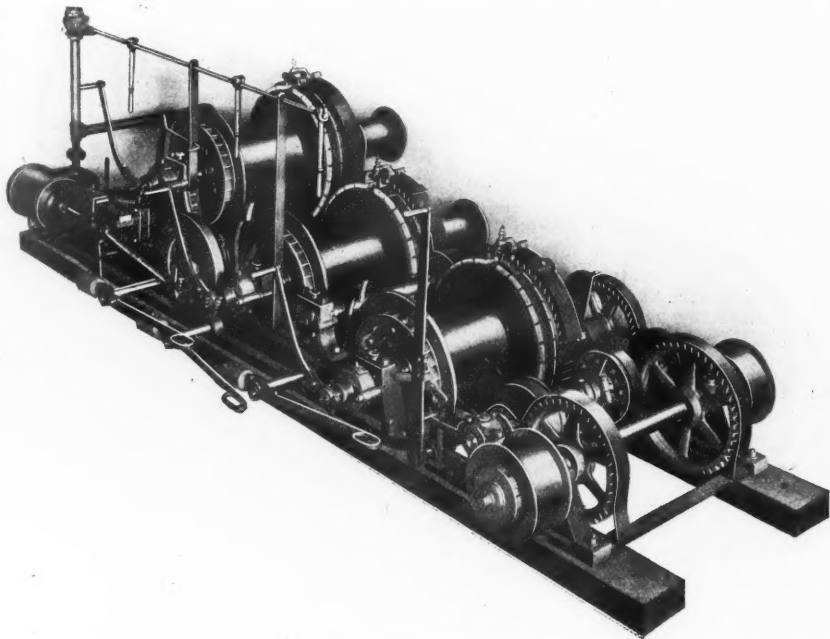
Running at the rate of 60 miles an hour just south of Reading, a train of the Philadelphia & Reading Railway, filled with passengers, came to a sudden stop last night, halted by the red light of a block signal. After waiting the minute in which a train is supposed to clear the short blocks, the engineer proceeded with caution, expecting a wreck, or at least a broken rail. . . . An inspector was sent out at once, and found the red still showing. A thorough examination overhead and above ground showed no defect. The inspector finally removed the top of the underground case, which contains the electric connections with the rails. A garter snake, 22 in. long, lay comfortably coiled, its head cushioned on the delicate spring, depressing it so that it made the contact necessary to set the signal at danger. The reptile had reached the height of its fame and met death in so doing.—*Allentown Leader*.

Contrary to our expectations, we find no foot note explaining that this is the *Leader's* prize story, the result of an exciting competition between all the romance writers of Pennsylvania, New Jersey and Delaware. It deserves the prize, however; at least for this season. The Massachusetts sparrow that lit on the counterweight of an enclosed disk signal will now take a back seat—or, rather, roost in the rear row.

Three Drum Tandem Lidgerwood Derrick Engine.

The double cylinder, three drum tandem Lidgerwood hoisting engine shown in the accompanying illustration is designed for use where it is desired to operate three hoisting lines or ropes. It needs one man to run it. Its construction is much the same as the standard two-drum hoisting engine built by the Lidgerwood Manufacturing Co., New York, with the addition of the third drum.

An equipment of the Buckeye Dredging Company, of Columbus, Ohio, for elevating gravel from barges is fixed on a steel tower 10 ft. square at the base, 5 ft. square at the top and 22 ft. high. The 10 x 12 double-cylinder, three-drum hoisting engine is on the same platform, steam being taken from the main boilers which operate the other machinery. The boom is 80 ft. long, of steel construction lattice-work pattern, and the derrick is rigged to handle a 1½-yard clam-shell bucket. The weight of the bucket loaded is 6,000 pounds.



Three Drum Tandem Lidgerwood Derrick Engine with No. 4 Swinging Gear.

The two rear drums of the engine are used to operate the bucket ropes, which are ¾ in., and lead from sheaves at the foot of the hoist direct to the drums. The forward drum is used to operate the boom topping lift, which is of ¾-in. rope and passes over rooster at top of mast direct to the engine. A No. 4 swinging gear is employed to operate the 16-ft. bull wheel for swinging the boom. The drums are so arranged that they may be operated independently of one another, or they may all be operated at the same time for hoisting, lowering or swinging. Each is equipped with a cone friction of wood, a steel band brake with segmental wood lining and a ratchet and pawl. The cone friction is employed for hoisting the load and the band brake for lowering. When it is desired to hold the load suspended at any particular point a pawl is used, and holds the ratchet which is cast on one flange of each drum.

Manufacturing and Business.

The Sprague Electric Company now has a permanent office in the Atlas Building on Mission street, San Francisco, Cal.

C. L. Bundy, general foreman of the D., L. & W. shops at Scranton, Pa., has been appointed manager of the car department of the Hicks Locomotive & Car Works, Chicago.

The Boston offices of the Niles-Bement-Pond Company and the Pratt & Whitney Company have been removed from Pearl street to the Oliver building, corner of Milk and Oliver streets.

Among recent orders taken by the Scherzer Rolling Lift Bridge Co., Chicago, Ill., are the following: Two double-track rolling lift bridges for the Norfolk & Western, having movable spans of 145 ft. and 160 ft. respectively and designed for the heaviest engine loadings; a double-track single-leaf bridge of 160 ft. span for the Egyptian Government to be erected at Khartoum; a long span bridge ordered by the Burma Railways to be erected over the Ngawun river in India; and an order from Sir Benjamin Baker for the new Buccleugh bridge, Barrow-in-Furness, England. The Scherzer bridge over the Suir river, Ireland, for the Fishguard & Rosslare Railway is nearing completion and substantial progress is being made in the construction of the Walney Island bridge, England, and the Ekaterinhofka bridge, Russia. The Buenos Aires Great Southern Railway is building two double-track Scherzer lift bridges at Buenos Aires, Argentina. The Dutch Railroad is also building one of the bridges across the Spaarne river, Holland, on its main line. For all of these bridges the Scherzer Rolling Lift Bridge Company, Monadnock Block, Chicago, furnishes the designs, plans and specifications and consulting engineering services, co-operating with the engineers of the various railroad companies and governments.

Iron and Steel.

The Vanderbilt roads will soon let contracts for rails for 1907 delivery for between 110,000 and 150,000 tons.

The Illinois Central has ordered 3,000 tons of bridge material and the Western Pacific is receiving bids on 6,000 tons.

The Minneapolis, St. Paul & Sault Ste. Marie has bought 12,500 tons of rails, and another contract has been let for 5,000 tons in Chicago.

The Great Northern has bought 30,000 tons of rails, the Erie 10,000 tons and the Lehigh Valley 10,000 tons, all for delivery next year.

The American Bridge Co. did a much larger business in the month of June than anticipated. New bookings aggregated 60,000 tons, about the same amount as in May. The company has just closed a contract for the erection of the open hearth furnaces for the steel plant at Gary, Ind., and has sold to the Southern Railway about 15,000 tons of steel.

The New York, New Haven & Hartford, it is reported, is to buy two Scherzer draw-bridges, involving an aggregate of 1,000 tons of structural steel, and will also let additional contracts for considerable more bridge work shortly. The New York Central is calling for several new bridges; the Chicago Great Western will soon contract for 1,500 tons, while numerous other roads are to buy fully 150,000 tons for 1907.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

Traveling Engineers' Association.

The fourteenth annual convention of this association will be held at the Auditorium Hotel, Chicago, Ill., August 28th, and will probably be in session four days. Rooms can be had at the following rates (European plan): Single room, one person, without bath, \$2 a day; double room, without bath, \$3; single room, with bath, \$3.50; double room, with bath, \$5. The Pullman Company, as heretofore, has arranged for reduced rate privileges to members and their families going to and returning from the convention. Members desiring to avail themselves of the one-half rates will make application to the Secretary, stating the members of the family who intend to accompany them and specify the road over which they intend to travel and one-half rate orders will be furnished to and from the convention. The committees will present valuable papers.

ELECTIONS AND APPOINTMENTS.**Executive, Financial and Legal Officers.**

Dublin & Southwestern.—D. R. Thomas has been appointed Secretary and Auditor, and Otis Ellison, Treasurer; both with office at Tennille, Ga.

Interstate Commerce Commission.—The nomination, by the President, of F. K. Lane, of California, to succeed J. W. Fifer has been confirmed by the Senate. The President has nominated E. E. Clark, of Iowa, as one of the two new Commissioners which the Hepburn bill provides for. Mr. Clark is Grand Chief of the Order of Railway Conductors, and was on the Anthracite Coal Strike Commission in 1902.

Norfolk & Southern.—G. G. Boardman has been appointed Treasurer and Assistant Secretary, with office at New York, succeeding C. W. Van Voorhis, resigned.

Operating Officers.

Atlantic Coast Line.—L. E. Spencer has been appointed Superintendent of Terminals at Jacksonville, Fla., succeeding R. A. McCranie, transferred.

Dublin & Southwestern.—T. T. Hollomon has been appointed Superintendent, with office at Tennille, Ga.

Colorado & Wyoming.—J. B. McKennan has been appointed General Superintendent of the Middle division. The authority of George Van Brimer, Superintendent of the Middle division, has been extended over the Northern division.

Gainesville & Gulf.—C. N. Adkinson has been appointed General Manager.

Gulf, Colorado & Santa Fe.—F. G. Pettibone, General Superintendent, has been elected Second Vice-President and General Manager, succeeding W. C. Nixon. See St. Louis & San Francisco.

Louisiana & Arkansas.—F. W. Green, Superintendent of the Missouri Pacific at Wynne, Ark., has been appointed General Superintendent of the L. & A., with office at Stamps, Ark.—See St. Louis & San Francisco.

Missouri Pacific.—See Louisiana & Arkansas.

St. Louis & San Francisco.—W. C. Nixon, Second Vice-President and General Manager of the Gulf, Colorado & Santa Fe, has been elected Vice-President and General Manager of the St. L. & S. F., succeeding, as General Manager, C. R. Gray, who remains Vice-President in charge of operation. W. T. Tyler, General Manager of the Louisiana & Arkansas, has been appointed General Superintendent of the second district of the S. L. & S. F., with office at Springfield, Mo., succeeding S. L. Rainey, assigned to other work on account of ill health.

Traffic Officers.

Atlantic Coast Line.—W. F. Kirkland, Commercial Agent at Montgomery, Ala., has been appointed to the new office of Assistant General Freight Agent at Jacksonville, Fla.

Dublin & Southwestern.—M. V. Mahoney has been appointed General Freight and Passenger Agent, with office at Dublin, Ga.

Engineering and Rolling Stock Officers.

Chicago, Burlington & Quincy.—G. M. Reynolds has been appointed Master Mechanic at Alliance, Neb., succeeding E. W. Fitt, transferred.

Chicago, Rock Island & Pacific.—E. D. Andrews, Master Mechanic at Dalhart, Tex., has been appointed to the new office of Master Mechanic of the Arkansas division, extending from Booneville to Memphis, and of the Louisiana division, consisting of the new lines being built under the name of the Rock Island, Arkansas & Louisiana in that state; office at Little Rock, Ark.

International & Great Northern.—F. Hufsmith, Superintendent of Motive Power and Rolling Stock, has resigned and the office has been abolished. George S. Hunter, General Foreman, has been appointed General Master Mechanic, succeeding to Mr. Hufsmith's duties.

Missouri Pacific.—F. J. Kraemer has been appointed Master Mechanic at Baring Cross, Ark., succeeding C. A. Braun.

LOCOMOTIVE BUILDING.

The Central of Brazil has ordered six locomotives from the Baldwin Works.

The Colorado & Southern, it is reported, is in the market for locomotives.

The Mexican Central, it is reported, is in the market for upwards of 35 locomotives.

The Pittsburg, Binghamton & Eastern has ordered three locomotives from the American Locomotive Works.

J. G. White & Company has ordered four locomotives from the Baldwin Works for use in the Philippine Islands.

The New York, New Haven & Hartford, it is reported, has ordered 42 locomotives from the American Locomotive Co.

The Atlantic & Birmingham Construction Co., it is reported, has placed an order with the Baldwin Locomotive Works for four locomotives.

The Brookville & Mahoning, it is reported, will shortly order a number of locomotives for next year's delivery. Address C. E. Barrett, 277 Broadway, New York.

The Baldwin Locomotive Works, it is reported, during the first six months of this year built upwards of 1,311 locomotives, 62 more than ever before recorded for the same period. The total number of men employed at the works is 21,245.

The Quebec Central, as reported in a previous issue, has ordered two simple mogul locomotives from the Canadian Locomotive Co. for December, 1906, delivery. These engines will weigh 144,000 lbs., with 122,000 lbs. on drivers; cylinders, 20 in. x 26 in.; diameter of drivers, 50 in.; extended wagon top boiler, with a working steam pressure of 200 lbs.; total heating surface, 1,921 sq. ft.; 280 steel tubes, 2 in. in diameter by 12 ft. long; firebox, 100 in. long by 40 in. wide; grate area, 26¼ sq. ft.; tank capacity, 4,000 gallons, and coal capacity, 10 tons. The special equipment includes Westinghouse air-brakes, asbestos boiler lagging, Sterlingworth brake-beams, Tower couplers, Hancock injectors, U. S. metallic piston and valve rod packing, World safety valves, Witson's sanding devices, Nathan sight feed lubricators, French springs, and Consolidated steam heat equipment.

The Boston & Maine has ordered 12 simple mogul (2-6-0) locomotives and 10 simple consolidation (2-8-0) locomotives from the American Locomotive Co., for November delivery. The mogul locomotives will weigh 140,000 lbs., with 121,000 lbs. on the drivers; cylinders, 19 in. x 26 in.; diameter of drivers, 63 in.; radial stay extended wagon top boiler, with a working steam pressure of 200 lbs.; heating surface, 1,893.2 sq. ft.; 286 American Locomotive Co.'s charcoal iron tubes, 2 in. in diameter and 11 ft. 8 in. long; Worth Bros. steel firebox, 108½ in. x 40½ in.; grate area, 30.2 sq. ft.; tank capacity, 5,000 gallons, and coal capacity, 10 tons. The con-

consolidation locomotives will weigh 170,000 lbs., with 148,000 lbs. on the drivers; cylinders, 20 in. x 30 in.; diameter of drivers, 61 in.; radial stay boiler, with a working steam pressure of 200 lbs.; heating surface, 2,859.87 sq. ft.; 326 American Locomotive Co.'s charcoal iron tubes, 2 in. in diameter and 16 ft. long; Worth Bros. steel firebox, 102½ in. x 65¼ in.; grate area, 46.5 sq. ft.; tank capacity, 5,000 gallons, and coal capacity, 10 tons. The special equipment for both includes: Westinghouse-American air-brakes, Carnegie axles, Franklin boiler lagging, Sterlingworth brake-beams, American Brake Shoe & Foundry Co.'s brake-shoes, Tower couplers, F. O. Dewey's headlights, Hancock Inspirator Co.'s injector for mogul locomotives, and Wm. Sellers & Co.'s injector for consolidation locomotives, Downing piston and valve rod packings, Ashton safety valve, Hanlon sanding devices, Detroit sight-feed lubricators, Pittsburg Spring & Steel Co.'s springs, American steam gages and Midvale driving wheel tires. The Walschaert valve gear will be used on the consolidation locomotives.

CAR BUILDING.

The Mobile & Ohio is in the market for 200 gondola cars.

The Chesapeake & Ohio has ordered one dining car from the Pullman Co.

The Norfolk & Western is in the market for additional passenger equipment.

The Florida East Coast has ordered 200 flat cars from the Pressed Steel Car Co.

The Illinois Central, it is reported, will shortly place orders for upwards of 20 passenger coaches.

The St. Louis, Brownsville & Mexico has ordered 20 tank cars from the American Car & Foundry Co.

The Mineral Range has ordered 60 hopper bottom cars of 80,000 lbs. capacity from the American Car & Foundry Co.

The Erie, it is reported, has ordered 500 gondola cars of 100,000 lbs. capacity and 500 flat cars of 80,000 lbs. capacity from the Standard Steel Car Co., and 500 produce cars of 80,000 lbs. capacity from the American Car & Foundry Company.

The Canadian Pacific has placed an order for one air-brake construction car at its Angus shops and is building 30 vans at its Farnham shops. The vans will be 29 ft. 9 in. long over frame. The special equipment includes: Christie brake-shoes, Westinghouse air-brakes, Tower couplers, Miner tandem draft rigging and "Goff" type trucks.

The Canadian Northern has ordered 550 new box cars to be delivered in time for moving this season's western wheat crop. The order was placed as follows: Rhodes, Curry & Co., 250 cars; Canada Car Co., 200 cars, and the Crossin Car Mfg. Co., 100 cars. This order is in addition to the 1,600 cars ordered earlier in the season.

The Chihuahua & Pacific has ordered two cabooses from the Mt. Vernon Car Manufacturing Co., for August delivery. These cabooses will be 30 ft. 6 in. long and 8 ft. 6 in. wide, over all; and 10 ft. 11 in. high, over cupola. The special equipment includes: Sterlingworth brake-beams, Christie brake-shoes, Westinghouse brakes, Standard Coupler Co.'s couplers, Canda draft rigging, McCord journal boxes and Railway Steel Spring Co.'s springs.

RAILROAD STRUCTURES.

BIRMINGHAM, ALA.—Work is expected to start soon on the \$100,000 office building and freight house to be built by the Southern Railway at South 20th street.

FLOMATON, ALA.—The Louisville & Nashville will build a passenger station here to cost \$28,000.

MUSKOGEE, I. T.—Alex H. Tombly, of New York City, estimates the cost of a steel bridge over the Arkansas river preparatory to building an electric line into Fort Gibson to be \$100,000.

NEW ORLEANS, LA.—Work will soon be started on a large new elevator, which will form part of the terminals in St. Bernard of the New Orleans Terminal Company. The contract for the elevator was let recently, and the subcontract for the steel material has also been let. The elevator will have a capacity of 1,500,000 bushels and will be built of steel, with the latest appliances. The Terminal Company is also to make important improvements at Port Chalmette. The wharves there will be repaired and enlarged at an expense of \$50,000.

ROANOKE.—The Tidewater has bought land at a cost of about \$100,000 for a new yard. The yard will be about 1½ miles long. The company will probably build repair shops here, and make Roanoke division headquarters.

SCHENECTADY, N. Y.—Announcement has been made that the contract for building the New York Central passenger station has been

let to Guy B. Dickinson of Syracuse. The main room in the center, the upper part of which will be in the form of a rotunda, will be 100 by 200 feet. In Schenectady the railroads are elevated, so that from the waiting room the passengers will pass out under the tracks through avenues which will lead to the different platforms for different trains.

SIDNEY, OHIO.—Bids are wanted by J. C. Rosser, Auditor of Shelby County, July 30, for the construction of a two-span high-truss bridge to carry single-track, each span 125 ft. long, with an 18-ft. roadway over the Great Miami river; also for the construction of the substructure, consisting of one abutment and superstructure for a one-span, high-truss, single-track bridge 80 ft. long, 16-ft. roadway over the Miami and Erie Canal.

WOODBURY, N. Y.—Contract is reported let by the Erie to Weakland Brothers, of Philadelphia, for building a steel viaduct over the valley of Moodna Creek near this place. Work has already been started by the company's men on the concrete piers and the anchorages. The viaduct is to be 4,000 ft. long, 190 ft. above the bed of the stream and 90 ft. above the Greycourt branch.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

BESSEMER & LAKE ERIE.—This company, which started work in April last year on the Western Allegheny branch from Queen Junction, on the main line, has all the track laid west to a point about five miles east of New Castle. At a point just east of Rose Point the line crosses a large viaduct about 560 ft. long which has recently been completed. Grading is now under way from this point west to a connection with the Allegheny & Western, which is part of the Buffalo, Rochester & Pittsburgh. This short connecting link is to be used jointly by the Bessemer & Lake Erie and the Buffalo, Rochester & Pittsburgh. (See Construction Record.)

BUFFALO, ROCHESTER & PITTSBURG.—This company is reported making surveys to build an extension of its road from Iselin, Pa., southwest to Pittsburgh. The proposed line will cross the Bessemer & Lake Erie near New Texas. The company at present has a track-age agreement with the B. & O. from Butler to Pittsburgh.

CAIRO & THEBES.—The route of this proposed road, to connect Cairo and Thebes, has been surveyed for nine miles from Cairo, Ill., toward Thebes, and plans are ready for immediate building of the line. The road will run between the Mississippi river and the tracks of the Mobile & Ohio for the entire distance. President Smith is authority for the statement that the Iron Mountain, St. Louis Southwestern, Rock Island, Burlington and Chicago & Eastern Illinois from the north and the Louisville & Nashville and the Cumberland Gap from the south will use the new line. (May 4, p. 136.)

CANADIAN PACIFIC.—Sir Thomas G. Shaughnessy, President of this road, says that the company has now 900 miles of new road under construction. By the time the western crops are ready to be moved there will be 150 miles of double track between Winnipeg and Fort-William.

CANADIAN EASTERN.—Incorporation granted by the Quebec Legislature to this company with \$25,000,000 capital to build a line from Montreal northeast to the Atlantic coast or to the Gulf of St. Lawrence, with branch lines. The Directors are: E. B. Garneau, of Quebec; L. Moore, V. Cussow, D. W. Campbell and A. Geoffrion, of Montreal. The principal office will be at Montreal.

COLORADO & SOUTHERN.—The company has not yet selected the route for the proposed northern extension to the Yellowstone river in Montana. Connections will probably be made at Buffalo and Sheridan, Wyo., but the road's engineers are still surveying the most available routes through Montana. It is expected that they will submit their reports in August.

DAKOTA MIDLAND.—Incorporated in South Dakota with \$500,000 capital to build a line crossing the state from north to south along the Missouri river. L. R. Giddings and L. E. Giddings, of New York, are the promoters. Others interested in the project are: Charles O. Elwood, of Minneapolis, Minn.; Phil. Lawrence and M. E. Priter, of Huron, S. Dak. The office of the company is to be at Huron, S. Dak. The proposed route is from a point on the Sioux river in Union County, opposite Sioux City, northwest through the state to a point on the north line in Campbell County, passing through the Counties of Union, Clay, Yankton, Turner, Hutchinson, Douglas, Davison, Aurora, Brule, Jerauld, Buffalo, Hand, Hyde, Hughes, Sully, Potter, Faulk, Walworth, Edmunds, Campbell and McPherson.

DELAWARE & HUDSON.—Construction work is well under way on the line from Rouse's Point, N. Y., to Napierville, Que. Five miles are graded and track-laying will commence this week. The Pacific Construction Co., of Ottawa, will do the track-laying and ballasting. The work on the new line from Napierville to St. Constance is also well advanced. The D. & H. will build to St. Lambert and there

make connection with its recently acquired South Shore system. (June 15, 1906.)

DENVER & RIO GRANDE.—A line 14½ miles long is being built from the Rio Grande Western to the mines of the Utah Copper Co., near Bingham, Utah. The new line will be used by both the Utah Copper Co. and the Boston Consolidated Mining Co. The contract for grading, which will be mostly through rock, has been let to the Utah Construction Co., of Ogden. The maximum gradient is 2½ per cent., maximum curvature 16 deg. There will be two small tunnels, aggregating less than 600 ft. in length, and a number of wooden trestles. Work will soon be under way. No track yet laid. (June 22, p. 181.)

ELDORADO, MARION & SOUTHWESTERN.—This company has been incorporated in Illinois to build a line from Eldorado through Saline, Williamson, Jackson, Union and Alexander Counties to the Mississippi river. The incorporators and first board of directors are: S. T. Brush, Carbondale; John Colp, Cartersville; Charles Agent, Marion; S. H. Rudy and Charles E. Owen, Cartersville.

ELMIRA & SENECA LAKE TRACTION.—This company, recently incorporated in New York with \$200,000 capital, has bought the property and franchise of the Elmira & Seneca Lake Railway Company, operating a line 17 miles long from Seneca Lake, N. Y. The principal office is in Watkins, N. Y. Among the directors are: William H. Wadhams, Murray W. Dodge, A. S. Cook, I. B. Grant, all of New York City.

ERIE, LONDON & TILSONBURG (ELECTRIC).—Incorporated, with office at Tilsonburg, Ont., and \$1,000,000 capital, to build a line from Port Burwell, Ont., on Lake Erie northwest via Aylmer to London, approximately 40 miles, with a branch from a point on the main line east to Tilsonburg, an additional 15 miles. E. C. Jackson and E. V. Tillson, of Tilsonburg; J. H. Teall, Vienna; W. Warnock, Aylmer, and W. Thompson, London, are incorporators. (March 30, p. 98.)

ESSEX TERMINAL.—This company, incorporated in 1902 to build a line from Walkerville, on the Grand Trunk, Pere Marquette & Wabash, in the southwest corner of Ontario, south to Amherstburg, about 20 miles, and which has its charter amended in 1904, has applied to the Railway Commission for the approval of its location plans. F. A. Hough and J. A. Auld, of Amherstburg; S. A. King, Windsor, and G. F. Porter and W. Pope, of Walkerville, are said to be provisional directors.

FLORIDA EAST COAST.—According to local reports this company is considering the question of building an extension from a point on its main line west to Tampa, Fla.

FOX RIVER VALLEY (ELECTRIC).—This company, organized in Wisconsin last year, has increased its capital stock from \$25,000 to \$200,000, and decided to build from Manitowoc, Wis., south about 30 miles to Sheboygan at once. A part of the line is to be completed this summer and the road extended next year from Manitowoc northeast to Kaukauna, 40 miles.

HALIFAX & SOUTHWESTERN.—Ballasting is under way on this Mackenzie-Mann line between Liverpool and Shelburne, N. S., and the permanent bridge at Liverpool is nearly completed. The line through to Yarmouth is expected to be opened for traffic this year. The ballasting of the Middleton and Victoria Beach section has been completed and it is expected to soon have the line opened for traffic. (See Construction Record.)

INTERIOR & WEST VIRGINIA.—Incorporated in West Virginia to build a line from a point in Monroe County, West Virginia, on the boundary of Giles County, Va., northeast to a point in Monroe County near Potts Creek, in Craig County, Va. The incorporators are L. E. Johnson, of the Norfolk & Western, and J. I. Doran, T. W. Reath, D. C. Callahan and W. C. MacDowell, of Philadelphia. This is reported to be a project of the Norfolk & Western.

INTEROCEANIC.—Preliminary work, it is announced, will shortly be started on the improvement of this line from Mexico City east to the port of Vera Cruz. The road, which at present is narrow gauge, is to be made standard. The work has been under consideration for over a year, but the final surveys have only recently been completed. The line is to be shortened, all the heavy grades reduced, and sharp curves made easier. Orders are soon to be given for 75-lb. rails for the new work. The greater part of the line, which is about 350 miles long, has been ballasted, and it is expected to have the work completed at an expenditure of about \$6,000,000 (Mexican), during the next 18 months.

INTERSTATE RAILWAY (MISSOURI) (ELECTRIC).—Incorporated in Missouri to build an electric line from Kansas City north to St. Joseph, 47 miles. Application will be made for authority to cross highways in Buchanan County. The line is to be double-tracked and may use electricity or steam as a motive power. George R. Collins, of Kansas City, is the chief promoter.

IOWA CITY, MONTEZUMA & WESTERN (ELECTRIC).—Incorporated in Iowa to build an electric line from Iowa City, Iowa, west to

Montezuma, approximately 60 miles. E. B. Macey and L. H. Bufkin, of Lynnvill; J. W. Carr, of Montezuma; F. O. Hardington, of York; P. S. Carson, of Iowa City; M. C. Rohret, of Union, and others, are interested.

JAMES BAY.—An officer writes that the contract has been let to Angus Sinclair, of Parry Sound, Ont., for building a branch from the Toronto-Sudbury line in Ontario to Key Inlet, about 10 miles. Work is to be started at once. (June 22, p. 182.)

KANSAS CITY, MEXICO & ORIENT.—Vice-President E. Dickinson is quoted as saying that the 619 miles of road now in operation will be increased to 1,100 miles soon after Jan. 1. In Mexico half of the territory is now covered with a completed line, 325 miles of the 635 now being finished. (See Construction Record.)

LAS VEGAS & TONOPAH.—An officer writes that a contract has been let to Deal Bros. & Mendenhall, of Springville, Utah, for building this road from Las Vegas, Nev., on the San Pedro, Los Angeles & Salt Lake, northwest via Indian Creek to the Bullfrog mining district, 123 miles; and a length of 96 miles has been completed. The company will build from Bullfrog northwest to Goldfield, an additional 75 miles. The work will be easy, being mostly over a level country. (June 15, p. 175.)

LORAIN & ASHLAND.—See Lorain, Ashland & Southern.

LORAIN, ASHLAND & SOUTHERN.—Announcement is made by Joseph Ramsey, Jr., of the consolidation of the Industrial and the Lorain & Ashland Railroads and the decision to at once begin the construction of an extension south to the Ohio river at a cost of \$5,000,000. The consolidated railroad will be known as the Lorain, Ashland & Southern. Preliminary surveys have been made.

LOUISVILLE & NASHVILLE.—The route of the proposed line for which the contract has been let to the Walton, Wilson & Rodes Company, of Knoxville, Tenn. (the Madisonville, Hartford & Eastern), is from Madisonville, Ky., east, crossing Pond river, Green river, and the O. & N. division of the Louisville & Nashville, 10 miles north of Central City; thence through Centertown, Hartford, Sunnysdale and Dundee to Mitchell on the Louisville, Henderson & St. Louis. George W. Feagin, of Hartford, Ky., is Chief Engineer. (June 22, p. 182.)

Surveys, it is reported, are being made by this company for a line from Fourmile in Bell County, Ky., west to Williamsburg in Whitley County, approximately 30 miles, to connect two of the company's existing lines. Contracts are also reported let to improve the line from Barboursville, Knox County, south to Flat Lick, nine miles.

MADISONVILLE, HARTFORD & EASTERN.—See Louisville & Nashville.

MAYFIELD & COLUMBUS.—Contracts are reported let by this company to build its proposed line from Mayfield, Ky., to Columbus, approximately 30 miles. Surveys have been completed and right of way secured. W. B. Stanfield is Chief Engineer, Mayfield, Ky.

MONONGAHELA.—An inspection was recently made of this road by the Pennsylvania and Baltimore & Ohio officials with a view of extending the line along the east bank of the Monongahela river to Fairmont and there make connection with the projected West Virginia line. In this an attempt will be made to get the better of other interests who are trying to get into the West Virginia coal district. The Monongahela operates about 58 miles of line in the lower Connellsville and Klondike coke regions, and is owned jointly by the Pennsylvania and the Pittsburgh & Lake Erie. On this line a large amount of coal and coke tonnage originates, and this is delivered almost entirely to the Pennsylvania and Pittsburgh & Lake Erie. Small shipments are also made to the Baltimore & Ohio.

NAPIERVILLE JUNCTION RAILWAY.—See Delaware & Hudson.

NEW YORK CITY SUBWAYS.—The Rapid Transit Commission of New York City is planning to ask for bids for building subways in Lexington, Third, Seventh and Eighth avenues, Manhattan, and in Fourth avenue, Brooklyn, on or before January 1 next. The various commissions appointed by the court have reported favorably on nine of the 11 routes thus far considered. The Appellate Division, it is expected, will shortly give its assent to the plans. As soon as that approval is given, Chief Engineer Rice will have plans made for the principal routes. The surveys have already been made. Chief Engineer Rice says it will take about three months to prepare the plans for the main tunnels, and these should be complete by November 1. The advertising for bids will take about 60 days, so that the awarding of the first large contracts may take place early in 1907. The limitation on the city's authority to incur debt will probably prevent the construction of more than one important subway within the next few years.

NORFOLK & WESTERN.—See Interior & West Virginia.

NORTHEASTERN.—Incorporated by J. C. Heintz, P. Harnischfyer, New York; J. T. Marchand, J. B. Lapointe, Montreal, and R. Chevril, Ottawa, with \$1,000,000 capital and office in Montreal, at the last session of the Quebec Legislature to build the following lines:

From a point near Ville Marie, on Lake Temiskaming, east, passing the southern bays of Lakes des Quinze, Victoria and Kakebonga, to Quebec; from Lake Temiskaming to the National Transcontinental near Lake Abitibi; from near Lake Kakebonga to Maniwaki, and from near the Gatineau river to Nominigue.

PENNSYLVANIA.—This company expects about August 1 to open for operation its low-grade freight line between Columbia and Atglen. The work that still remains to be done is a cut of 1,000 ft. near Quarryville. Atglen, the eastern terminus of the low-grade line, is 47 miles west of Philadelphia. Between that point and Glen Loch, where the Trenton cut-off begins, a distance of 22 miles, two freight tracks have already been built for the greater part of the way and are now in use. From Glen Loch to 56th street, Philadelphia, about 20 miles, the company intends to build a separate freight line south of the present main line, and has already secured most of the right of way.

PINAR DEL RIO NORTHERN.—Incorporated in Maine with \$3,000,000 capital to build railroads in the island of Cuba. F. H. Morrill, of Portland, Maine, is President, and F. R. Barrett, of the same place, is Treasurer.

RIO GRANDE WESTERN.—See Denver & Rio Grande.

ST. LOUIS & NORTH ARKANSAS.—At a recent meeting of the bondholders of this company, plans were made for extending the line from its northern terminus at Seligman, Mo., northwest to Neosho, where connection is to be made with the Kansas City Southern; also for extending from the southern terminus at Leslie southeast to the eastern boundary of Arkansas at Helena or Memphis, about 150 miles; and for a branch south to Little Rock, 90 miles. When the reorganization of the company is arranged John Scullin will probably be Chairman of the Board and D. R. Francis, President.

SOUTHERN.—A contract is about to be let to W. J. Oliver, of Knoxville, Tenn., at about \$1,000,000, for extending the tracks from the Lookout Mountain tunnel to the Belt Railway, and for four-tracking the Belt Railway from this point to where it crosses the Central of Georgia tracks in South Chattanooga; from this point the Central of Georgia tracks will be used in reaching the new terminal station. (May 11, p. 144.)

STEWARTSTOWN.—This company, operating seven miles of road from New Freedom, Pa., on the Northern Central, in York County, east to Stewartstown, has begun running regular trains east to Fawn Grove, 10 miles over the new extension.

TEMISKAMING & NORTHERN ONTARIO.—The Ontario government has authorized this company to build three short branches to the Cobalt mining area and the agricultural region to the north. One of these is from Halleybury to the Dominion government wharf on Lake Temiskaming; another from Englehart to Charlton, serving a district around Long Lake; and a third from a point near Cobalt to Kerr Lake, six miles distant, giving shipment facilities to many working mines.

UNION PACIFIC.—It is reported that this company is making surveys for a line from Kansas City to a connection with the Illinois Central at Memphis, Tenn., about 370 miles, air line. Such a line would, in connection with the Illinois Central, give the U. P. a route to the gulf.

VERSAILLES & SEDALIA.—This line, which extends from Versailles, Mo., to the property of the Missouri Canal Coal Co., about six miles, is to be extended to Sedalia, Mo., about 24 miles. James Applewhite, of Memphis, Tenn., is President, and G. D. Albe, of Versailles, Mo., Vice-President and General Manager.

WABASH.—According to reports this company contemplates making important improvements at Decatur, Ill., the most important of which will be a reinforced concrete bridge over the Sangamon river. A contract for double-tracking the road from Decatur east to Bement, 20 miles, to remove a 1 per cent. grade and to change the alignment so as to eliminate the 4 deg. curves in the present line has been let. This work necessitates about 600,000 yards of grading. When this work is finished the Wabash will have completed the double-tracking from Decatur, where the line diverges toward St. Louis and Kansas City to Bement, where the line from Chicago joins that from the east.

RAILROAD CORPORATION NEWS.

BALTIMORE & OHIO.—Part of the proceeds of the sale of the \$27,500,000 new capital stock recently issued were used to pay off the \$9,000,000 three months' loan made to the company by the National City Bank of New York last April.

CANADIAN PACIFIC.—The land sales during June amounted to 75,403 acres, an increase of 10,435 acres over June, 1905. The sales realized \$588,013, an increase of \$247,254.

CHICAGO, PEORIA & ST. LOUIS.—The semi-annual interest on the

\$2,000,000 consolidated mortgage 5 per cent. bonds, which fell due on July 1, has not been paid. The president has addressed a circular to the bondholders explaining that the payment of the interest has been postponed because in the last year the deficit after charges has been largely increased over the \$97,103 reported in July, 1905.

CHICAGO RAILWAYS CO.—Marshall G. Sampsell has been named as the seventh director of the Chicago Railways Co., which will take over the Chicago Union Traction. (June 15, p. 176.)

CHICAGO UNION TRACTION.—See Chicago Railways Co.

CINCINNATI, HAMILTON & DAYTON.—The receiver has asked permission to issue \$511,000 receiver's certificates, maturing July 1, 1906, and bearing not more than 6 per cent. interest. The issue is for the purpose of paying interest due on mortgage bonds.

ERIE.—This company has bought about four acres of land on the Harlem river, near 149th street, New York City, to be used for a freight yard instead of that used at present near the East river. The new property is now occupied by a lumber company under a lease which will not expire for 18 months.

LEHIGH COAL & NAVIGATION.—Of the \$17,378,500 outstanding stock of this company, \$13,327,250 was, in October, 1905, put into the hands of a voting trust with power to sell at not less than \$135 per share. The holders of about \$5,000,000 of the stock have asked the trustees to raise this minimum selling price to \$200 per share.

MICHIGAN CENTRAL.—Minority stockholders of this company have recently made efforts to get larger dividends on the stock, which at present is paying 4 per cent. annually. It is contended that surplus earnings have been used for improvements which ought to have been charged to capital account.

NEW YORK CENTRAL LINES.—The gross earnings of this system in June are shown in the following table:

	1906.	Increase.
New York Central & Hudson River	\$7,649,645	\$595,784
Lake Shore & Michigan Southern	3,557,298	496,451
Lake Erie & Western	402,461	3,901
Chicago, Indiana & Southern	169,409	13,871
New York, Chicago & St. Louis	791,631	79,935
Michigan Central	2,173,444	273,021
Cleveland, Cincinnati, Chicago & St. Louis	2,059,791	111,214
Peoria & Eastern	257,607	40,809
Cincinnati Northern	94,258	18,630
Pittsburg & Lake Erie	1,359,776	276,310
Rutland	257,801	30,783
Total	\$18,753,121	\$1,850,709

NORTH AMERICAN COMPANY.—This company, which controls all the street railways in and near St. Louis, excepting the St. Louis & Suburban, and nearly all the light and power plants in that city, is completing negotiations for the purchase of the St. Louis & Suburban, which has outstanding \$3,924,000 capital stock and \$4,500,000 bonds, and operates 120 miles of road. The stock will be exchanged for an equal amount of preferred stock of the United Railways of St. Louis, a subdivision of the North American Co. The transfer is to be made on August 1.

NORFOLK & WESTERN.—The company has sold to Brown Brothers & Co., New York, \$4,000,000 equipment trust notes, bearing 4 per cent. interest, maturing semi-annually for ten years from 1907. This is in addition to the \$3,000,000 issued and sold this spring. The company has sold to the same firm \$2,000,000 divisional first lien and general mortgage 4 per cent. bonds of 1944, making \$13,000,000 outstanding of the \$35,000,000 authorized.

NORTH SHORE.—An assessment of \$10 per share, payable immediately, has been levied on the holders of the \$6,000,000 capital stock.

PERE MARQUETTE.—The receiver has been authorized to issue \$419,180 receiver's certificates to run for not more than one year from July 1, 1906, and bearing not more than 6 per cent. interest. The proceeds are to be used for the payment of the July interest on certain bonds.

ST. LOUIS & SUBURBAN (ELECTRIC).—See North American Company.

TOLEDO & WESTERN (ELECTRIC).—A call has been made for a meeting of the bondholders on July 16 at Toledo, Ohio, for the purpose of selecting a committee of two to act with the Ohio Savings Bank & Trust Co. in protecting the interests of the bondholders during the receivership. The notice is signed by J. K. Secor, J. G. Mitchell and H. C. Rorick. (July 6, p. 6.)

TOLEDO, ST. LOUIS & WESTERN.—This company has sold to Brown Brothers & Co., New York, \$1,000,000 4½ per cent. equipment notes maturing in semi-annual installments for 10 years beginning March 1, 1907. They are secured on 750 box cars and 500 coal cars. The Pennsylvania Company for Insurance on Lives and Granting Annuities is the trustee.

UNITED RAILWAYS OF ST. LOUIS.—See North American Company.

